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AUTHOR	Gilpatrick, Eleanor
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ABSTRACT

Part II of the second of four volumes in Research Report No. 7 of the Health Services Mobility Study (HSMS), this book is the remainder of Chapter 3, which contains 76 task descriptions covering most of the medical activities carried out by radiologic technologists. The steps of the task descriptions are presented in logical sequence in considerable detail by Code Number. (Part I of this volume contains Chapters 1, 2, and the first part of 3. Volume 4 is an index of all the tasks in the three volumes). These task descriptions are offered for use as instructional materials, as inputs to the design of career ladders, for the structuring of jobs, and as inputs to the development of performance evaluation instruments and proficiency tests. (HD)

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TASK DESCRIPTIONS IN DIAGNOSTIC RADIOLOGY

Research Report No. 7

Volume 2

RADIOLOGIC TECHNOLOGIST TASKS DEALING WITH PATIENT PROCEDURES

Part II: Tasks 387 Through 526

by
Eleanor Gilpatrick, Director
Health Services Mobility Study

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Tasks 387 Through 526

CHAPTER 3 (continued)

TASK DESCRIPTIONS:

RADIOLOGIC TECHNOLOGIST PATIENT PROCEDURES (continued)

There are 76 tasks included in this chapter. These are arranged numerically by Task Code Number from Code 7 to Code 526. Part I covers tasks 7 through 386; Part II (this document) covers tasks 387 through 526. Please note that not all tasks with code numbers between 387 and 526 are represented in Part II of this volume.

There is no chapter pagination. Instead, the pages within each task are numbered. The user can find the task by referring to the Task Code Number and task page number at the upper right of each page.

TASK DESCRIPTION SHEET

Task Code No. 387

This is page 1 of 17 for this task.

1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured;scout taken; technical factors selected and set;radiologist assisted with test dose,infusion or injection of contrast;compression applied;series of postinjection and postmicturition urograms taken as ordered,processed,presented;pt. returned;examination recorded; urograms placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, medical-technical history,prior radiographs;phone; view boxes;pen;x-ray generator,control panels,tube, bucky,table,collimator;ID,R-L,time interval,breath control markers;compression devices;procedure tray with materials for test dose and full dose of iodine based contrast solution;materials for IV infusion; emergency cart;clock;extension cones;stool;calipers; vertical holder;cassettes;shielding;heating device; immobilization devices;technique,standard view,tube rating and rad exposure charts;forms;intercom; stretcher;wheelchair

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Non-pediatric pt. to have intravenous pyelography; radiologist;co-workers;nurse

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking intravenous pyelograms and urograms of nonpediatric patient by reviewing request;preparing pt. and equipment;taking scout;assisting with test dose and injection or infusion of contrast;setting technical factors;identifying film;positioning pt.;providing shielding,compression,collimating;taking series of postinjection and postmicturition urograms as ordered;arranging for processing;presenting for review;continuing as ordered;having pt. returned;placing urograms for use;recording.

List Elements Fully

Performer receives or obtains the x-ray requisition form,patient identification card, and any appropriate medical-technical history for a non-pediatric patient scheduled for intravenous pyelography (IVP, excretory method of urography of kidneys, ureters and bladder after injection of contrast medium into a vein) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.

Request may be for routine IVP, special request,or request for simultaneous urography and cholegraphy. Performer may also receive prior scouts, radiographs, and/or record of exposure technique(s) used and/or any changes necessary.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, and to check the completeness of the information provided:

   a. Performer checks the examination called for and the purpose. Notes whether a routine study is ordered with routine scout ordered, and whether contrast will be introduced by hypodermic injection, IV in-

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

TASK DESCRIPTION SHEET (continued)

Task Code No. 387

This is page 2 of 17 for this task.

List Elements Fully | **List Elements Fully**

fusion, whether minute sequence filming is ordered, and whether cholegraphy will be involved. Notes whether area of interest is localized, whether films of urethra may be required; notes side of interest.

b. Notes the name of the radiologist in charge; may note the name of the referring clinician.

c. Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is in-patient, out-patient, or emergency patient. Notes any special information or note on known pathology that could affect patient positioning, technique, or handling. Notes whether patient has history of allergies, whether test dose of contrast is planned.

d. Performer checks whether patient is suffering from a collateral condition requiring special handling such as heart disease, communicable [illegible] infectious condition, infirmity, incoherence. Notes whether patient will be on a stretcher or in a wheelchair. Notes whether patient will be accompanied by nurse or other staff person.

e. Notes orders for use or nonuse of ureteric compression device.
Notes which phase of suspended respiration is to be used.
Notes shielding appropriate for examination based on sex, age and positions ordered.

f. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done elsewhere in recent past, whether there is history of extensive radiography to bring to radiologist's notice.

ii) Checks whether any special orders on exposure factors are in keeping with the usual rad exposure involved for the examination.

iii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.

g. Performer notes any orders for prior preparation of patient such as preliminary diet, laxative, abstinence from liquids for a given period of time, use of cleansing enema. Notes whether these have been recorded as carried out. If appropriate, arranges to have any omitted steps carried out with delay in examination.

h. If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer brings this to attention of radiologist in charge. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

i. If prior radiographs already on file are to be presented with scout film to radiologist, and if not already with patient's

TASK DESCRIPTION SHEET (continued)

Task Code No. 387

This is page 3 of 17 for this task.

List Elements Fully

jacketed material, performer arranges to have prior films delivered.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary:

   a. Washes hands as appropriate.
   b. Checks that procedure tray has been prepared for the study involved or decides to do personally. Checks that materials are present for test dose, injection or infusion of contrast. Checks that correct contrast material has been provided. If appropriate, may heat contrast to body temperature. Makes sure that emergency cart is present. Checks for emesis basin, towels, availability of cold water.
   c. Checks that proper accessories are available for procedure including leaded rubber shielding and aprons, to be used by performer, the patient, and/or anyone who will remain in the room during exposure.
   d. Checks that appropriate immobilization devices are present such as ureteric compression belt or block; that there is a mattress, pads, pillows and/or blankets for comfort of patient. May attach footboard to table, shoulder supports and/or hand holds.
   e. Makes sure that right (R) and left (L) markers are available for use, identification cards, or leaded numerals or markers, and markers to indicate post-injection time intervals and positions.
   f. Performer makes sure that upright cassette holder and an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Selects appropriate speed and type of film, grid and cassette combination depending on the techniques to be used and standard institutional practices. Selects size based on patient's size and area of interest. If adequate supply is not in room, arranges to obtain or decides to obtain personally.

List Elements Fully

   g. Performer prepares for identification of overhead films using equipment provided by institution:

      i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.
      ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write or type out ID information on card if not received with requisition.
      iii) Checks identification against requisition sheet.

   h. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).
   i. Performer checks that x-ray equipment is ready for use. Goes to control panel and checks that indicator light shows that machine is "warmed up," or turns on main

TASK DESCRIPTION SHEET (continued)

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This is page 4 of 17 for this task.

List Elements Fully

switch as appropriate to equipment and allows time for the machine to "warm up." If appropriate, performer may set radiography mode selector and set collimator control for manual operation. Makes sure that all circuits have been stabilized.

3. Performer readies patient for the examination:

   a. Performer washes hands as appropriate. Depending on patient's condition, may decide to arrange for or carry out isolation or decontamination techniques.
   b. Performer has the patient called from the holding area and prepared for the examination (if not already done), or decides to do personally.
   c. Depending on institutional arrangements, performer may decide to escort out-patient to or from dressing room. May decide to assist in transporting patient from holding area or have this done.
   d. Performer greets patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. If patient is accompanied because of seriousness of condition, performer checks with accompanying staff member on any special precautions necessary during procedure.
   e. Performer has patient assume a comfortable recumbent or seated position, as appropriate.

      i) If appropriate, places mattress, pillow, or clean linen on x-ray table. May place pad, blanket or pillow under bony prominences to provide comfort for recumbent patient.
      ii) If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.
      iii) Performer may decide to assist patient from wheelchair or stretcher to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.
      iv) If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.
      v) If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table. May arrange to move or have patient moved to table.

   f. If not already done, has patient's clothing removed and provides gown or drape. May assist patient or request assistance from nurse. Permits patient to keep covered with gown until measurements are taken and until exposure. Treats young patient with as much courtesy as adult.
   g. Performer questions patient about any orders for preparatory procedures to check that patient has followed them correctly.

      i) If not already done, may question patient about any allergies to shellfish or adverse reactions to contrast medium (especially iodine-based).

TASK DESCRIPTION SHEET (continued)

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List Elements Fully

ii) Performer may ask patient to refrain as much as possible from swallowing before and during the examination to reduce presence of gas.

iii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

iv) If there is any possibility that patient is pregnant and this has not already been recorded, or if patient has unrecorded sensitivity to contrast, or if patient has not carried out prior preparation, performer informs radiologist and proceeds only with approval.

h. If not already done, performer explains to patient what will be involved in the procedure:

i) Describes what will happen in allergy test, the injection or infusion of the contrast. Performer may explain to patient that side effects may be felt from contrast medium such as feeling of nausea, flushing, choking sensation. Reassures patient that vomiting is normal and that emesis basin and care will be provided.

ii) Performer indicates the need for compression of the ureters even though there may be some discomfort. Explains the probable time intervals between filming periods and the fact that patient will not be left and forgotten. Gives patient an idea of the range of time that may be required for the procedure.

List Elements Fully

iii) Performer explains what cooperation will be asked of patient. Explains the importance of proper breathing and relaxation. Indicates what types of positions the patient will be asked to assume. May demonstrate how tilt table will be used and reassures patient that he or she will be held safely.

iv) Performer answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Remains aware that patient may be frightened and/or in pain. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

i. Performer encourages patient to relax. Rehearses patient in suspending respiration (inhalation or exhalation) and relaxing. Performer may check patient's relaxation by keeping hand on patient's back to detect tenseness. Performer may judge time interval needed after cessation of respiration for patient to relax and plans to adjust exposure timing accordingly.

j. Unless measurements have already been made, performer uses centimeter calipers to measure the thickness of the abdomen in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film.

i) Performer evaluates the patient's bodily habitus to

TASK DESCRIPTION SHEET (continued)

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This is page 6 of 17 for this task.

List Elements Fully

estimate the position of the kidneys and variations in location between recumbent and erect positioning.

ii) If both recumbent and erect positioning will be used, performer may measure or estimate thickness in both positions.

iii) If combined urography and cholegraphy is ordered, estimates location of gallbladder and variations based on positioning similarly.

iv) Notes whether the areas of interest are heavily covered by muscle or soft fat, whether the palpation points will be easy to find. Notes whether the extremities are of unequal length.

v) Records measurements for determining exposure factors for overheads.

k. If not already done, performer has patient empty bladder completely. Has patient void in bathroom or provides bedpan. May decide to assist patient.

l. Has patient relax in supine or prone position on examination table depending on views ordered for scout filming or whether examination by radiologist will follow. May have patient remain in prone position to dissipate gas.

4. If appropriate before radiologist's examination, and if not already done, performer arranges to take scout of abdomen:

a. If a scout film has already been made and viewed by radiologist, performer notes the technique used or ordered and plans technical factors for overhead radiography, adjusting as appropriate.

List Elements Fully

b. If a scout film has been made but not approved, performer places processed scout film and any prior films with patient's chart or places on view boxes for review by radiologist.

c. Unless already done, performer selects and sets the technical factors for the scout film of the abdomen:

i) Consults the technique chart posted for the machine. Locates the information needed for the body part and projection involved according to the centimeter thickness of the part and position as measured, and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed and use of other accessories (such as screens, grids, bucky, etc.).

ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.

iii) Once the standard kVp, mA and time have been determined, performer makes any conversions necessary to account for extreme fat or muscularity, the preference of the radiologist involved, and any other conversion needed such as posted changes. Performer looks up numerical conversion factors and calculates or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.

TASK DESCRIPTION SHEET (continued)

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iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs.

d. Performer sets the exposure factors as selected:

i) Sets controls for radiography mode.
ii) If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.
iii) For conventional exposure control, performer sets the milliamperage selected for the correct focal spot size. Sets the selected exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major kilovoltage and minor kilovoltage settings to produce the desired kVp.
iv) For automatic phototimed exposure control, performer sets the category corresponding to the type of study and use of screens, bucky, etc., and, if appropriate, focal spot size. Sets a control corresponding to the selected field size (as listed on technique chart for phototiming).
May set a kVp range button, if called for with equipment, corresponding to the appropriate kV range for the examination.

List Elements Fully

Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.
v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustments of table, tube height, position, and of collimation.

e. Performer obtains the appropriate size loaded cassette for the first (or next) scout projection. Attaches identification information to the cassette or table top:

i) Places right or left marker on film holder or table-top as appropriate or depresses appropriate R or L button for automatic marking.
ii) If patient's identification information is in the form of lead numerals or marker, performer places on appropriate corner of cassette.
iii) If patient identification information is to be entered by use of flasher, sets flash card aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
iv) Performer may place patient's card into card tray for equipment using automatic film marking device.
v) Performer places cassette in bucky. May manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back.

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This is page 8 of 17 for this task.

List Elements Fully

Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

5. Performer positions as follows (or as described below for later steps) depending on the positions ordered for scout film(s):

   a. Performer may explain or demonstrate to patient what is required. May obtain help in positioning.
   b. For a supine AP projection (posterior view) of abdomen, performer aligns patient in supine position, with the median sagittal plane of the body centered to the midline of the table.

      i) Elevates patient's shoulders and knees so that patient's back is in contact with table. Supports. Adjusts shoulders and hips so that they lie on single transverse planes. May immobilize ankles. Has patient flex elbows and abduct arms.
      ii) Performer centers the cassette at the level of the iliac crests unless otherwise specified. Makes sure not to use visual points of muscle or fatty tissue and palpates for the crest of the bone.
      iii) Directs central ray at right angles to the midpoint of the film.

   c. For a prone PA projection (anterior view) of the abdomen, performer has patient lie in prone PA position on table, with median sagittal plane centered to midline.

      i) Has patient flex elbows, place arms in a comfortable position.

List Elements Fully

Supports ankles. Rests patient's head on cheek or chin. May have patient rest hands beneath chest. May support head and upper chest.
      ii) Centers cassette to the level of the iliac crests, third lumbar body, or as ordered.
      iii) Directs central ray at right angles to midpoint of film.

   d. Performer rehearses patient in relaxing and breathing in and holding or breathing out and holding, depending on orders. Plans to use the same phase of respiration for all films unless otherwise ordered.
   e. Performer avoids applying direct pressure to abdomen if there is any danger of intra-abdominal neoplasm.
   f. Performer sets the focal-film distance if not already done as appropriate. Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD (TFD) is obtained.
   g. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. Adjusts the collimator so that a small unexposed border will appear aroung the edge of the film or collimates further so as to expose only the area of interest (and thus provide maximum

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protection and detail). Adjusts primary beam to minimum size needed to cover the area(s) of interest.

h. Performer adds lead shielding to areas that will be in the primary path of the beam but are not included in the areas of interest, especially gonads. Provides patient and everyone who will remain in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

i. When everything is ready for the exposure, performer reminds patient of the cooperation and breath control to be used for exposure. Encourages patient to relax. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

j. Performer returns to control room. Makes sure controls are properly set, and that patient is still in position.

6. Performer makes exposure:

   a. Calls or uses intercom to tell patient to carry out breathing instructions as rehearsed. Has patient breathe out and hold for suspended exhalation, or breathe in and hold for suspended inhalation.

   b. When respiration has been suspended, performer waits one or two seconds to allow involuntary movement of viscera to subside and then makes exposure, or waits number of seconds judged necessary for patient to relax.

   c. Performer initiates exposure by pressing hand trigger or exposure control button.

      i) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

      ii) May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction may decide to report; anticipates need to repeat exposure.

      iii) With phototimer notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure.

      iv) After exposure is completed tells patient that he or she can breathe.

      v) If the exposure is terminated by a circuit breaker, rechecks technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.

   d. After exposure removes cassette and removes markers for further use.

   e. The performer arranges to have the scout film processed at once or decides to do personally.

      i) Attaches ID card for use with flasher if appropriate. May sign requisition.

      ii) While the film is being processed and/or evaluated performer has patient relax in examination room or holding area. Explains what will happen next. If appropriate,

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This is page 10 of 17 for this task.

List Elements Fully

List Elements Fully

makes sure that patient will be attended while waiting.

7. Performer informs attending radiologist when patient is ready to be examined. Brings requisition sheet, patient's medical history, chart, processed scout film (if already done) and any prior films to radiologist. Displays radiographs on view boxes.

   a. If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist.
   b. Performer may accompany radiologist to examination room and introduce patient to radiologist or calls patient from holding area.
   c. If not already done, performer awaits and carries out radiologist's orders for scout film. Proceeds as appropriate and presents processed scout for review as described above.

8. During radiologist's review of requisition, scout, prior films and examination of patient, performer notes radiologist's decisions and orders:

   a. If radiologist indicates that procedure is to be terminated because there are contraindications, performer proceeds to termination steps as described below. If appropriate, arranges to have proper forms filled out and/or new requisition for other procedure made out and signed.
   b. If radiologist decides that the area under study is poorly visualized and that gas or feces may be cleared, performer may arrange to have radiologist's orders carried out:

      i) May arrange to have patient rescheduled, have radiologist sign requisition sheet. For out-patient may have instructions reinforced or decides to do personally.
      ii) May have gas clearing or cleansing procedures carried out at once or decides to do personally.
      iii) Once clearing or cleansing procedures are carried out, performer may repeat scout filming as described above and present to radiologist for review as described above.

   c. If radiologist indicates that the scout film is not technically adequate, performer notes radiologist's orders for change in technical factors, patient position, tube position, and/or centering of film.

      i) Notes whether need to repeat is due to performer's own negligence or lack of attention so that performer can avoid future "retakes." If request for retake reflects malfunctioning equipment, performer reports malfunction to appropriate staff member. If request for retake reflects the preference for density or contrast of the radiologist, performer notes for future use to avoid future "retakes."
      ii) May make additional scouts as described in later steps or repeats as described above, and presents for review until radiologist indicates that area is properly visualized.

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This is page 11 of 17 for this task.

List Elements Fully

d. When scout film is judged adequate, and if radiologist decides to proceed, performer notes radiologist's orders on the conduct of the examination:

  i) Notes whether a test dose will be administered.
  ii) Notes whether contrast will be administered by intravenous injection or infusion.
  iii) Notes radiologist's orders for postinjection time sequence, use of compression, areas of interest, patient positions, centering.
  iv) May note orders on amount of contrast or change of equipment or supplies and injection site.
  v) Performer may check to be sure what areas are to be included in the radiographs and what gonadal protection can be provided without interfering with diagnostic purpose of study.

9. Performer prepares for procedure before the injection of the contrast:

  a. Performer sets technical factors for first post-injection overhead as described, adjusting for patient's position, radiologist's orders after viewing scout, and use of contrast material. Identifies first cassette as appropriate and places in bucky, adjusting centering as ordered.
  b. May have syringes or IV bottle prepared with contrast medium (iodine based solution) or decides to do personally. May check to see that temperature is appropriate. If combined urography and cholegraphy is ordered,makes sure that appropriate contrast is used.
  c. If intravenous infusion method is to be used, performer may set up IV infusion apparatus. Attaches bottle of prepared contrast solution to sterile IV tubing. Hangs at appropriate height on pole near patient with clamp in closed position.
  d. Arranges to provide or change any equipment or supplies as ordered by radiologist.
  e. Performer may position patient on examination table as appropriate for introduction of contrast and first overhead film. May have injection site prepared or decides to do personally. May place compression device for immediate use as appropriate. May apply gonadal shielding if not already done.
  f. Performer may provide emesis basin and clean towels.
  g. Informs radiologist when patient and materials are ready for introduction of contrast solution.

10. If performer is to assist with test injection and/or administration of contrast medium, washes hands, observing sterile technique as appropriate.

  a. If appropriate, performer opens packet of sterile gloves for radiologist, observing sterile technique so that wrapper, own hands, or other objects will not contaminate gloves.
  b. May assist as appropriate by handing materials and supplies asked for. May provide support for the arm used for injection.
  c. Performer assists radiologist to care for patient if there is nausea or vomiting. Reassures patient. Cleans patient. May provide damp cold towel to aleviate flushing symptoms.

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d. With infusion technique,performer may periodically check that needle has not become dislodged and that the fluid is dripping at an even rate. If there are any problems, performer clamps tube and notifies an MD or RN at once.

e. If so ordered, lowers head end of table and makes sure that patient is securely held.

f. When ordered,performer applies compression device over the lower ends of the ureters. Uses ureteric belt or compression block and band as appropriate. May provide pad under the pelvis.

g. Performer checks order for correct sequence of films, time intervals involved, and side of interest as appropriate.

h. Keeps track of the time elapsed. If appropriate, makes sure that patient is in the care of a staff person who will observe patient's reactions or decides to do personally.

i. Throughout procedure performer remains alert for any symptom of severe pain or adverse reaction to the contrast. As soon as performer judges that reaction may be severe, ceases procedure and notifies radiologist or attending physician at once.

11. Performer plans the overhead series as ordered.

a. Plans to process each set of radiographs in series as soon as exposed and present to radiologist for review to avoid unnecessary radiography and to permit radiologist to revise orders to accommodate to patient's condition and the evidence on the radiographs.

b. Performer makes sure to include time-interval marker on each cassette.

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c. If centering has not been indicated by radiologist,performer judges the location of the kidneys based on the patient's type of body (habitus) and the evidence of any prior films. Plans to adjust for higher centering for supine positions and obese, hypersthenic patients, and lower centering for erect positioning and thin, asthenic patients.

12. Performer positions as follows or as described earlier depending on radiologist's orders:

a. For variations of supine AP projections (posterior views) of the kidneys and ureters, performer positions patient and centers as described earlier except as follows:

i) Performer may direct central ray at 5° cephalad to the midpoint of film.

ii) Performer may lower head end of table 15° to 20° and direct central ray at right angles to midpoint of film.

b. For oblique projections of the kidneys performer notes whether anterior oblique projections are ordered or posterior oblique projections, and the side of interest; notes whether bilateral views are ordered. Performer may substitute right PA oblique projection for left AP oblique projection and/or left PA oblique projection for right AP oblique projection as appropriate to the patient's condition.

i) For anterior (AP) oblique projections (posterior oblique views) performer starts with

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patient in supine position. For posterior (PA) oblique projections (anterior oblique views) performer starts with patient in prone position.

ii) For a left AP oblique projection (left posterior oblique view) performer rotates supine patient 40° to 45° and supports the elevated (right) side. Places arms in comfortable position with shoulders in a single transverse plane. Centers cassette to the upper lumbar vertebrae adjusted for patient's body type and somewhat higher than for right view, at about the level of the xiphoid process. Directs central ray at right angles to midpoint of film.

iii) For a right AP oblique projection performer positions patient similarly to (ii), above but on opposite side. Centers cassette somewhat lower than for left view.

iv) For PA oblique projections (anterior oblique views) performer positions prone patient with coronal plane of the upper lumbar vertebrae on side of interest centered to midline. Has patient rest head on cheek on side of interest with arm alongside body. Rotates body so that opposite side is elevated 45°. Has patient support himself or herself on opposite side forearm and flexed knee. Centers film as described in (ii) and (iii) above. Directs central ray at right angles to midpoint of film.

c. Performer again checks for ability of patient to relax, and repeats appropriate breathing instructions.

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Repeats appropriate collimation. Provides shielding and makes exposure as described above.

i) For small fields performer attaches an auxiliary extension cone to collimator to further reduce the primary beam.

ii) Repeats orders for breath control and relaxation for the same phase of respiration. If different phase is ordered from that planned for series, marks cassette accordingly.

iii) Performer makes serial exposure as described above. Arranges to have each pyelogram processed as soon as exposed.

iv) While films are being processed, performer makes sure that patient is comfortable and, if necessary, attended by radiologist or staff member. Refrains from commenting on the films or providing any interpretation to patient.

v) Places the films on view boxes as processed, in order, as they are taken. May hang scout and prior films. Informs radiologist as each processed film is ready for viewing.

d. Performer notes radiologist's instructions after each film is reviewed. As appropriate, makes changes in timing, technical factors, patient positioning, projections, central ray and table angulation.

e. When ordered, performer removes compression device. Releases pressure slowly to prevent visceral rupture.

f. Notes orders for timing for overheads of ureter(s), bladder,

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proximal urethra, (and biliary tract if cholegraphy is combined with urography).

13. If serial films of the biliary tract are to be made, performer notes timing and marks cassettes as described above.

    a. For a right AP oblique projection (right posterior oblique view) of the extrahepatic bile ducts, performer has patient assume a supine position with the estimated area of the biliary tract centered to the midline of the table.

        i) Elevates the left side of the body about 15° to 20°. Supports the elevated shoulder, hip and knee. Has patient extend hips and knees so that back is arched. May place arms in comfortable position with hands under or above head.
        ii) Centers film to estimated biliary tract area adjusted for patient's position and body type or as indicated.
        iii) Places inflated bag or radiolucent wedge under abdomen.
        iv) Directs central ray at right angles to midpoint of film or at 20° cephalad to the center of the film.

    b. Performer notes any orders for film of gallbladder (if not already visualized on serial films) and projection required. Judges the location of the gallbladder based on evidence of prior films, patient's body type or any centering mark made by radiologist.
    c. Adjusts technical factors, tube, and position of patient or film holder as appropriate. Repeats identification, collimation, shielding, orders for breath control, exposure and viewing by radiologist as appropriate.

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14. If overheads of the ureter(s) and bladder are ordered, performer positions as described earlier or below, depending on radiologist's orders and standard procedures:

    a. If radiologist orders AP supine projection of bladder and proximal part of urethra, performer positions patient in supine position as described, but may have patient extend legs so that anterior pelvic bones are tilted downward.

        i) Centers film a little above the upper border of the symphysis pubis.
        ii) Directs central ray at 5° caudad to midpoint of film, or 15° to 20° caudad with patient who has loss of normal lumbar curve.

    b. If radiologist orders PA prone projection of bladder and upper part of urethra, performer positions patient in prone position as described, but may direct central ray at 10° to 15° cephalad to enter about 1 inch distal to the tip of coccyx and exit a little above the upper border of the pubic symphysis.
    c. If radiologist orders oblique views of bladder, performer positions patient as described earlier, depending on view ordered and side of interest, but rotates body 40° to 60° as ordered. Centers the pubic arch on the side of interest to midline of table. Has patient extend and abduct

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upper thigh. Directs central ray at right angles to midpoint of film or at 10° caudad as ordered.

d. If radiologist orders lateral view(s) of bladder, performer notes whether posterior or anterior bladder wall is the area of interest.

  i) Places patient in supine position for view of posterior wall and in prone position for view of anterior wall.
  ii) Uses vertical bucky or cassette holder with film centered to the level of the bladder a little above the upper border of the symphysis pubis.
  iii) Directs central ray horizontally across table at right angles to midpoint of film.
  iv) Reverses position of central ray and cassette for opposite side lateral view.

e. If radiologist orders an axial view of posterior surface of bladder and lower end of ureters, performer has patient sit on side or end of table so that posterior surface of each knee is in contact with edge of table.

  i) Centers median sagittal plane of body to midline of table so that transverse axis of film coincides as nearly as possible to midaxillary plane of the body.
  ii) Centers film to median sagittal plane of pelvis.
  iii) May support feet with bench or stool. Has patient abduct thighs and lean directly forward until symphysis pubis is in close contact with table. May assist obese patient to achieve as close to a 45° angle of vertical axis of pelvis as possible. Has

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patient grasp ankles to maintain position.
  iv) Directs central ray at right angles to film, centered to the lumbosacral region at the level of the greater trochanters. If flexion is restricted, directs central ray anteriorly at right angles to the coronal plane of the symphysis pubis.

f. For an erect AP projection (posterior view) of the urinary tract, performer notes whether patient can be positioned in erect position or requires semierect positioning. Notes whether kidneys are to be included in view and/or bladder.

  i) For erect position, has patient stand facing away from vertical cassette holder or table, with median sagittal plane centered to the midline, and with weight equally distributed. Adjusts head and spine to a single plane, with shoulders in a single transverse line. Has patient flex elbows and place hands on upper chest. If limbs are of unequal length, supports shorter extremity.
  ii) Centers cassette to the level of the iliac crests, and includes the upper border of the twelfth thoracic vertebra and the pelvis.
  If kidney excursion is being studied, centers as for supine AP pyelography and allows for a drop of about two inches from supine position. If bladder and upper urethra is being studied, centers as described earlier.
  iii) Maintains patient in erect position long enough for fluid

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levels to be accurately demonstrated. Directs central ray horizontally at right angles to midpoint of film.

iv) For patients who cannot assume erect position, performer adjusts patient in semierect position. Attaches footrest to end of table and secures patient. With patient on table, performer moves it to almost vertical position. Centers as above with cassette in vertical bucky. Directs central ray horizontally to the midpoint of the film, regardless of the angulation of the table.

g. Performer repeats appropriate steps including identification of cassette, use of R-L and time elapse markers, selection and setting of technique, positioning patient and equipment for focus-object-film alignment, collimation, shielding, breathing instructions, making exposure, and processing, as described above.

h. Performer shows each radiograph to radiologist as processed, and proceeds as ordered until radiologist indicates that this stage of examination is completed.

i. Performer notes any orders from radiologist for films of bladder after voiding and/or any delayed films. May provide requisition sheet and have radiologist fill out and sign.

15. When pre-voiding radiography is completed,performer explains to patient whether procedure will be terminated or whether patient is to void and return for post-micturition film(s).

a. If not already done,assists with removal of IV apparatus or has this done.

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b. Assists patient to descend from table and walk to toilet, or provides bedpan.

If appropriate, moves x-ray tube and any protruding film holder away from patient before patient rises. May decide to assist patient from table. Makes sure patient is reminded of any footrest in stepping off table.

c. For post-micturition study,performer takes overheads in position(s) ordered, processes,and presents for review as described above.

d. For delayed films,performer may arrange to have patient taken to appropriate holding area. Keeps track of the time elapsed. If appropriate, makes sure that patient is in the care of a staff person who will transport to appropriate location and return patient at appropriate time. Takes delayed films as appropriate as described above.

16. When performer is told by radiologist that the examination has been completed, performer carries out termination steps for the examination:

a. May have patient transported back to holding area or next location, or decides to do personally, as appropriate. Makes sure that none of the equipment is projecting over the patient before allowing patient to rise.

b. If appropriate, makes sure that patient is in the care of a staff person who will transport to appropriate next location or, if out-patient, will arrange to discharge or send patient home (with escort if appropriate).

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c. May have room and equipment cleaned; has any other appropriate clean up procedures followed to avoid infection or contamination, or decides to do personally, depending on institutional procedures. d. Performer records the examination according to institutional procedures. May include date, room, examination type, the overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each overhead view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet. e. May present requisition form to radiologist for comments and signature. f. Performer may decide to jacket radiographs, requisition sheets, and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. g. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;equipment set up;pt. measured and reassured;scout of abdomen and scout tomograms taken as ordered;radiologist assisted with infusion; compression applied;films identified;technical factors,amplitude and layer height selected and set;pt. shielded,positioned;nephrotomograms taken,sent for processing,taken to radiologist;tomography,pyelography continued as ordered;patient returned;examination recorded;radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, medical-technical history,prior radiographs;phone; view boxes;pen;x-ray generator,control panels,tube, bucky,table,collimator;clock;tomographic attachment; ID,R-L,series,breath control,level,amplitude markers; compression devices;procedure tray with IV equipment, iodine based contrast solution;emergency cart;heating device;extension cones;stool;calipers;cassettes; lead apron,shielding;immobilization devices;technique,standard view,tube rating,cooling,and rad exposure charts;forms;intercom;stretcher;wheelchair

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(x) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Pt. to have nephrotomography;accompanying adult; radiologist;anesthesiologist;co-worker;nurse

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking infusion nephrotomograms of any pt.,by reviewing request;preparing pt. and equipment;measuring; taking scout overhead, tomograms as ordered;assisting with infusion of contrast;setting technical factors,amplitude,layer height as ordered;providing shielding;positioning pt.;collimating;identifying, exposing nephrotomograms;arranging for processing; taking to radiologist;continuing,taking pyelograms as ordered;having pt. returned;placing radiographs for use;recording.

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Performer receives or obtains the x-ray requisition form,patient identification card, and any appropriate medical-technical history for a patient scheduled for infusion nephrotomography (body section radiography of the kidney after intravenous infusion of contrast medium) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. From co-worker.

Request may include orders for pyelography (conventional radiography of kidney(s) and ureter(s).

Performer may also receive scout films and/or prior pyelograms with record of technical factors used and/or any changes necessary.

1. Performer reads the requisition sheet to determine the type of tomographic examination called for, the patient involved, area of interest, special considerations, and to check the completeness of the information provided:

   a. Performer checks the examination called for and the purpose. Notes whether a routine scout film and scout tomograms are ordered or any special requests.

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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b. Performer checks which kidney is involved, whether pyelography is ordered. Notes the name of the radiologist in charge; may note name of the referring clinician.

c. Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is in-patient, out-patient, or emergency patient. Notes any special information or note on known pathology that could affect patient positioning, technique, or handling. Notes any prior history of allergic reaction to contrast or allergies.

d. Notes whether tube-film travel pattern is specified(if more than one type of equipment is available), such as linear, circular, elliptical, or hypocycloidal tomography. Notes whether zonography is called for (exposure angle of 10° or less), whether plesiotomography is called for (simultaneous multi-level tomography using "book" cassettes). Notes whether asymmetrical tomography (incomplete linear sweep) is ordered.

e. Performer checks whether patient is suffering from a collateral condition requiring special handling such as heart disease, communicable or infectious condition, infirmity, incoherence. Notes whether patient will be on a stretcher or in a wheelchair. Notes orders for use or nonuse of ureteric compression. Notes whether patient will be accompanied by nurse or other staff person.

f. Notes which phase of suspended respiration is to be used. Notes the shielding appropriate for patient based on sex and positions ordered.

g. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

 i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done elsewhere in recent past, whether number of radiographs and tomographic exposures ordered or done in past should be brought to radiologist's attention.

 ii) Checks whether any special orders on exposure factors are in keeping with the usual rad exposure involved for the examination.

 iii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.

h. Performer notes any orders for prior preparation of patient such as preliminary diet, abstinence from food and/or drink, use of cleansing enemas. May note whether these have been recorded as carried out. If patient's record indicates orders for sedation or any other prior medication, or if anesthesia may be ordered for pediatric patient, performer may check timing to be sure a proper elapse of time has occurred for medication to take effect.
If appropriate, arranges to have any omitted steps carried out and/or delays examination.

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- i. If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer brings this to attention of radiologist in charge. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.
- j. If prior radiographs already on file are to be presented to radiologist and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary:

    - a. Washes hands as appropriate.
    - b. Checks that procedure tray has been prepared for the study involved or decides to do personally. Checks that materials are present for infusion of contrast solution. Makes sure emergency cart is present. Checks for emesis basin,towels, availability of cold water.
    - c. Performer makes sure that equipment has a tomography capability or that tomographic attachment is in room. Checks that x-ray tube has appropriately small fractional focal spot and that, if appropriate, additional filtration is available for tomography.

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    - d. Checks that proper accessories are available for procedure including leaded rubber aprons, shielding to be used by the performer, the patient, and anyone who will remain in the room during exposure.
    - e. Checks that appropriate immobilization devices are present, such as ureteric compression belt, blocks; checks that a mattress, pads, pillows and/or blankets are present for comfort of patient.
    - f. Makes sure that right (R) and left (L) markers are available for use, identification cards, or leaded numerals or markers, markers to indicate postinfusion time intervals, special positions or breath control, and markers to record level and amplitude of tomograms.
    - g. If appropriate, performer makes sure that contrast solution is at body temperature. May arrange to have it warmed or cooled.
    - h. Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room, including book cassettes if appropriate. Selects appropriate speed and type of film, grid,and cassette combination depending on the techniques to be used and standard institutional practices. Selects size based on patient's size and area of interest. If adequate supply is not in room, arranges to obtain or decides to obtain personally.
    - i. Performer prepares for identification of radiographs using equipment provided by institution:

        - i) May obtain lead numerals and tape and prepare identifica-

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tion strip for placement on film holder(s) giving appropriate patient identification information.

- ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may type or write out ID information on card if not received with requisition.
- iii) Checks identification against requisition sheet.

j. If appropriate, such as with wide angle hypocycloidal tomography, performer may insert additional filter (as designated) into beam column.

k. If a tomography attachment is to be put in place (to be used with conventional tubemount, generator, and horizontal bucky x-ray table), performer obtains the necessary equipment and assembles:

- i) Checks that table is in horizontal position.
- ii) Attaches fulcrum assembly along the table top rail at head end of table and secures.
- iii) Attaches fulcrum assembly plug to appropriate electrical receptacle.
- iv) Attaches the fulcrum bar and bucky link bar as appropriate to equipment and moves the tubemount over the fulcrum assembly. Adjusts so that angulation and fulcrum level indicators are facing appropriately.
- v) Slides fulcrum bar into fulcrum assembly as appropriate and locks.
- vi) Adjusts tubemount to prescribed focal-film distance. (May check technique chart for tomography.)

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- vii) Moves the tomographic mechanism manually through the maximum travel and checks that there are no restrictions such as from cables or other attachments. Adjusts as appropriate.
- viii) Engages the drive mechanism for horizontal travel as appropriate and removes engaging rod. Sets lock switch if appropriate to prevent alternative travel motion.

l. Makes sure that tomography power switch is off (if appropriate).

m. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

n. Performer checks that x-ray equipment is ready for use. Goes to control panel and checks that indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for the machine to "warm up." If appropriate, performer may set radiography and/or tomography mode selector and set collimator control for manual operation. Makes sure that all circuits have been stabilized.

o. Performer may note whether a preliminary scout film has already been made of the patient (done earlier and/or by another radiologic technologist).

- i) If a scout film has already been made and viewed by radiologist, performer notes the technique used or ordered and plans technical factors adjusting as appropriate.

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ii) If a scout film has been made but not approved, performer places processed scout film and any prior films with patient's chart or places on view box for review by radiologist.

iii) If a scout film has not been made and is required before patient is seen by radiologist, performer plans to proceed after readying patient as described below.

3. Performer readies patient for the examination:

   a. Performer washes hands again as appropriate. Depending on patient's condition, may decide to arrange for or carry out isolation or decontamination techniques.

   b. Performer has the patient called from the holding area and prepared for the examination (if not already done), or decides to do personally.

   c. Depending on institutional procedures, performer may decide to escort out-patient to or from dressing room. May decide to assist in transporting patient from holding area or have this done. If patient is already under general anesthesia has patient wheeled in under supervision of anesthesiologist.

   d. Performer greets patient (if conscious) and any accompanying staff person, and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. If patient is accompanied because of seriousness of condition, performer checks with accompanying staff member on any special precautions necessary during procedure.

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   e. Performer has patient assume a comfortable seated or recumbent supine position (unless prone position is called for and repositioning will be painful).

      i) If appropriate, places mattress, pillow or clean linen on x-ray table. May place pad, blanket or pillow under bony prominences to provide comfort for recumbent patient.

      ii) If patient is in wheelchair may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.

      iii) Performer may decide to assist patient from wheelchair or stretcher to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.

      iv) If assisting patient to step on footstool in order to get on table, helps patient turn on stool, and then sit and/or lie on table.

      v) If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table. May arrange to move or have patient moved to table.

   f. If not already done, has patient's clothing removed and provides gown or drape. May assist patient or request assistance from nurse. Permits patient to keep covered with gown until measurements are taken and until exposure. Treats young patient with as much courtesy as adult.

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g. If not already done, performer questions patient or accompanying adult about any preparatory procedures ordered.

  i) Checks that any preliminary diet ordered was followed. Checks that any order for prior abstinence from food and/or drink was adhered to. Checks that any orders for cleansing enema(s) were carried out.
  ii) If not already done, questions patient or accompanying adult about any allergies, especially to shellfish or adverse reactions to contrast medium (especially iodine based).
  iii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.
  iv) If there is any possibility that patient is pregnant and this has not already been recorded, or that patient has sensitivity to contrast, or that patient has not abstained from food or drink as ordered, performer informs radiologist at once and proceeds only with approval.

h. If not already done, performer explains to patient what will be involved in the procedure:

  i) Describes what will happen in infusion of the contrast solution and the tomography. Gives patient an idea of how long the entire procedure may take, the possibility of regular overhead filming, that patient may wait in holding area during serial filming.

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  ii) Performer may explain to patient that side effects may be felt from contrast medium such as feeling of nausea, flushing, choking sensation. Reassures patient that vomiting is normal and that emesis basin will be provided.
  iii) Performer may manually demonstrate the action of the x-ray tube during tomography.

i. Performer explains what cooperation will be asked of patient:

  i) Performer may ask patient to refrain as much as possible from swallowing before and during the examination to reduce presence of gas.
  ii) Performer describes the need for compression of the ureters, explaining that there may be some discomfort.
  iii) Explains the importance of patient's being able to relax. Indicates what types of positions the patient will be asked to assume. Describes the probable breathing control, use of compression devices, as appropriate. May demonstrate how tilt table will be used and reassure patient that he or she will be held safely.
  iv) Performer answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Remains aware that patient may be frightened and/or in pain. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

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j. Encourages patient (conscious) to relax. Rehearses patient in suspending respiration on exhalation and relaxing (or in suspended inhalation if ordered). May check patient's relaxation by keeping hand on patient's back to detect tenseness. Performer may judge time interval needed after cessation of respiration for patient to relax. Plans to adjust exposure timing accordingly.

k. Unless measurements have already been made, performer uses centimeter calipers to measure the thickness of the abdomen in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film.

   i) Performer evaluates the patient's bodily habitus to estimate the position of the kidneys.
   ii) Notes whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points are easy to find.
   iii) Records measurements for use in determining exposure factors.

l. If not already done, performer has patient empty bladder completely. Has patient void in bathroom or provides bedpan. May decide to assist patient. Has patient relax in supine or prone position on examination table depending on views ordered for scout filming or whether examination by radiologist will follow. May have patient remain in prone position to dissipate gas.

m. If appropriate before radiologist's examination and if not already done, performer arranges to take scout of abdomen. Otherwise waits until radiologist orders scouts.

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4. Unless already done, performer informs attending radiologist when patient is ready to be examined. Brings requisition sheet, patient's medical history, chart, any processed scout film and any prior films to radiologist. Displays radiographs on view boxes.

   a. If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist.
   b. Performer may accompany radiologist to examination room and introduce patient to radiologist.
   c. During radiologist's review of requisition, any prior scout, prior pyelograms and examination of patient, performer notes radiologist's orders:

      i) If radiologist decides to terminate procedure, performer proceeds to termination steps described below. If appropriate arranges to have proper forms filled out.
      ii) Notes radiologist's final orders on sequence of examination. May discuss. Arranges to provide or changes any equipment or supplies as ordered by radiologist.
      iii) If a scout film has already been processed, performer notes radiologist's orders for changes in technical fac-

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tors, patient position and/or centering.

- iv) If patient is to be placed under general anesthesia performer coordinates timing of procedure and scout filming with anesthesiologist.
- v) If not already done, performer awaits radiologist's orders for scout films as described below.
- vi) Performer then notes radiologist's orders for scout tomograms. Notes the patient positions and views called for, the area to be included in the central beam; notes the exposure angle (amplitude), speed, the number of "cuts," for the first preliminary scout tomograms (such as one "cut" at expected plane of interest, one or more at given cm's above and/or below).

5. If not already done, performer proceeds as ordered to make a scout film of the abdomen:

- a. Performer consults the technique chart posted for the machine. Locates the information needed for the body part and projection involved according to the centimeter thickness of the part and position as measured and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed and use of other accessories (such as screens, grids, bucky, etc.).
- b. Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.
- c. Once the standard kVp, mA and time has been determined, performer makes any conversions necessary to account for extreme fat or muscularity, age, the preference of the radiologist involved, and any other conversion needed such as posted changes. Performer looks at numerical conversion factors and calculates or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.
- d. Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs.
- e. Performer sets the exposure factors as selected:

  - i) Sets control for radiography mode.
  - ii) If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.
  - iii) For conventional exposure control, performer sets the milliamperage selected for the correct focal spot size. Sets the selected exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of kilovoltage settings to produce the desired kVp.
  - iv) For automatic phototimed exposure control, performer sets the category corresponding to the type of study and use of

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screens, bucky, etc., and, if appropriate, focal spot size. Sets a control corresponding to the selected field size (as listed on technique chart for phototiming).
May set a kVp range button, if called for with equipment, corresponding to the appropriate kV range for the examination.
Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustments of table and tube height, position, and of collimation.

f. Performer obtains the appropriate size loaded cassette for the scout projection. Attaches identification information to the cassette or table top:

- i) Places right or left marker on film holder or table-top as appropriate or depresses appropriate R or L button for automatic marking.
- ii) If patient's identification information is in the form of lead numerals or marker, performer places on appropriate corner of cassette.
- iii) If patient identification information is to be entered by use of flasher, sets flash card aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
- iv) Performer may place patient's card into card tray for equipment using automatic film marking device.
- v) Performer places cassette in bucky. May manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

g. Performer positions as follows (or as described below for later steps) depending on the position ordered for scout film. May explain or demonstrate to patient what is required. May obtain help in positioning.

h. For supine AP projection (posterior view) of the abdomen, performer has patient lie in a supine position on table.

- i) Centers the median sagittal plane of the body to the midline of table.
- ii) Elevates patient's shoulders and knees so that patient's back is in contact with table and supports. Arranges shoulders and hips to lie on single transverse planes. May immobilize ankles. Has patient flex elbows and abduct arms.
- iii) Performer centers the cassette at the level of the iliac crests unless otherwise specified. Makes sure not to use visual points of muscle or fatty tissue and palpates for the crest of the bone.
- iv) Directs central ray at right angles to the midpoint of the film.

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i. For a prone PA projection (anterior view) of the abdomen, performer has patient lie in prone PA position on table centered to midline.

   i) Has patient flex elbows, place arms in a comfortable position. Supports ankles. Rests patient's head on cheek or chin. May have patient rest hands beneath chest. May support head and upper chest.
   ii) Centers cassette to the level of the iliac crests, third lumbar body or as ordered.
   iii) Directs central ray at right angles to midpoint of film.

j. Performer rehearses patient in relaxing and breathing in and holding or breathing out and holding depending on orders. Plans to use the same phase of respiration for all films unless otherwise ordered.

k. Performer avoids applying direct pressure on abdomen if there is any danger of intra-abdominal neoplasm.

l. Performer sets the focal-film distance if not already done as appropriate. Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD (TFD) is obtained.

m. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. Adjusts the collimator so that a small unexposed border will appear around the edge of the film or collimates further so as to expose only the area of interest (and thus provide maximum protection and detail).
   Adjusts primary beam to minimum size needed to cover the area(s) of interest.

n. Performer adds lead shielding to areas that will be in the primary path of the beam but are not included in the areas of interest, especially gonads. Provides patient and anyone who will remain in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

o. When everything is ready for the exposure, reminds conscious patient of the cooperation and breath control to be used for exposure. Encourages patient to relax. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

p. Performer returns to control room for exposure.

   i) Makes sure controls are properly set, and that patient is still in position.
   ii) Calls or uses intercom to tell conscious patient to carry out breathing instructions as rehearsed. Has patient breathe out and hold for suspended exhalation, or breathe in and hold for suspended inhalation.

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iii) When respiration has been suspended, performer waits one or two seconds to allow involuntary movement of viscera to subside and then makes exposure or waits number of seconds judged necessary for patient to relax.

iv) If patient is under anesthesia performer arranges to make exposure on signal from anesthesiologist that respiratory arrest has been induced. Acts on anesthesiologist's signal.

v) Performer initiates exposure by pressing hand trigger or exposure control button.

vi) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

vii) May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction may decide to report; anticipates need to repeat exposure.

viii) With phototimer notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure.

ix) After exposure is completed tells patient that he or she can breathe or indicates to anesthesiologist that respiration can be resumed.

x) If the exposure is terminated by a circuit breaker, rechecks technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.

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xi) After exposure removes cassette and removes markers for further use.

q. The performer arranges to have the scout film processed at once or decides to do personally.

i) Attaches ID card for use with flasher if appropriate. May sign requisition.

ii) While the film is being processed and/or evaluated,performer has patient relax in examination room or holding area. Explains what will happen next. If appropriate, makes sure that patient will be attended while waiting.

r. Performer places the processed scout film for review and informs radiologist that it is ready. Notes radiologist's orders for changes in technical factors, as described above, and any changes in orders for scout tomograms.

6. When performer has radiologist's final decisions on the number of scouts, level(s) for the scout tomogram(s), the size of the "slice" (exposure angle or amplitude) and technical factors, performer prepares the equipment to make the preliminary exposure(s):

a. Performer selects the appropriate cassette size, with film and screen speeds appropriate to the equipment and the area of interest. Performer attaches identification information to the cassette or table top as described earlier. Prepares marker giving the level at which the fulcrum

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will be set for the given exposure and attaches to cassette or table-top as appropriate.

b. Performer places cassette into bucky tray as described earlier.

c. Performer sets the fulcrum (layer height) level for the first (or next) exposure:

  i) If a "book" cassette is to be used, performer sets the fulcrum level to coincide with the uppermost body layer to be projected.

  ii) If an automatic layer height selector is available, performer sets the controls to the interval distances selected, and sets the fulcrum for the uppermost or lowermost body layer desired depending on the direction of the automatic change.

  iii) Sets the fulcrum level using hand crank or power switch and checks the setting on the fulcrum (layer height) indicator.

d. Performer sets the amplitude (sweep):

  i) Makes sure that x-ray tube is centered at zero angle. Checks focal-film distance.

  ii) Sets the prescribed exposure angle or amplitude as appropriate for equipment and checks angle on indicator.

e. Performer sets the sweep speed as prescribed, according to the speeds available for the equipment, the exposure angle selected, and established procedure for the area of interest (or patient's age). Notes the duration or actual exposure time as the product of the angle and the sweep speed selected.

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f. For linear tomography, performer sets the directional control switch to right or left for horizontal travel to reflect the direction in which the tube will travel during the actual exposure.

  i) For other types of motion performer sets comparable selector(s) so that tubemount is in start position.

  ii) For asymmetrical exposure, determines whether the arc to be used will be at the beginning of tube travel or near the end, and adjusts equipment as appropriate.

g. Performer selects and sets the exposure factors for the first tomographic projection.

  i) Consults technique chart for tomography for the unit being used as described. Takes account of radiologist's orders for changes based on scout film.

  ii) Takes account of total heat units and checks with cooling chart. May plan pacing of exposures to allow cooling.

  iii) If appropriate, performer reconverts the technique to an equivalent output using higher kVp, lower mA, or faster sweep speed.

  iv) Performer may plan to vary the exposure technique for the scout nephrotomograms so as to provide radiologist with visual choice for the particular patient. If so, records the planned techniques for each scout film in relation to the level of the "cut" for each.

  v) Performer sets the exposure factors selected as described earlier.

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7. Performer positions patient for scout nephrotomograms as described above, as follows, or as described in later steps, depending on the positions ordered:

   a. For oblique projections of the kidneys, performer notes whether anterior oblique projections are ordered or posterior oblique projections, and the side of interest; notes whether bilateral views are ordered. Performer may substitute right PA oblique projection for left AP oblique projection and/or left PA oblique projection for right AP oblique projection as appropriate to the patient's condition.

      i) For anterior (AP) oblique projections (posterior oblique views) performer starts with patient in supine position. For posterior (PA) oblique projections (anterior oblique views) performer starts with patient in prone position.
      ii) For a left AP oblique projection (left posterior oblique view) performer rotates supine patient 40° to 45° and supports the elevated (right) side. Places arms in comfortable position with shoulders in a single transverse plane. Centers cassette to the upper lumbar vertebrae adjusted for patient's body type and somewhat higher than for right view, at about the level of the xiphoid process. Directs central ray at right angles to midpoint of film.
      iii) For a right AP oblique projection performer positions patient similarly to (ii), above,but on opposite side. Centers cassette somewhat lower than for left view.

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      iv) For PA oblique projections (anterior oblique views) performer positions prone patient with coronal plane of the upper lumbar vertebrae on the side of interest centered to midline. Has patient rest head on cheek on side of interest with arm alongside body. Rotates body so that opposite side is elevated 45°. Has patient support himself or herself on opposite side forearm and flexed knee. Centers film as described in (ii) and (iii) above.
      v) Directs central ray at right angles to midpoint of film.

   b. For a lateral view of kidney performer notes the side of interest and has patient assume lateral recumbent position on that side.

      i) Has patient flex knees comfortably, and centers midaxillary line to midline. Places supports under and between knees and ankles. Has patient flex elbows, place lower hand under head, and has patient grasp side of table with opposite hand. Supports thorax.
      ii) Centers cassette at the level of the upper lumbar vertebrae adjusted for patient's body type and somewhat higher for view of right kidney,at about the level of the xiphoid process.
      iii) Directs central ray at right angles to midpoint.

   c. Performer cautions patient to keep fingers away from table edges. Advises patient to keep eyes closed to avoid following

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the movement of the x-ray tube. Explains that patient must hold position for successive "cuts."

d. Performer checks that no obstructions are present which might restrict tubemount travel such as palpator or cables.

e. Performer again checks for ability of patient to relax and repeats appropriate breathing instructions. Repeats appropriate collimation. For small fields performer attaches an auxiliary extension cone to collimator to further reduce the primary beam. Provides shielding as appropriate.

f. Performer tests tomographic set-up by proceeding with tubemount sweep but not activating exposure. Has patient practice breathing out and holding still as ordered and permits patient to sense the duration time for each sweep:

   i) Turns on power for tomographic attachment or mode. Using appropriate switch, activates tomographic sweep action without activating exposure, and holds until tubemount reaches the extreme limit of travel.
   ii) Returns tubemount to other extreme position, holding until tubemount travel is complete. Interrupts travel at any point and makes any adjustments necessary. Returns equipment to "start" position.

8. When everything is ready for the tomographic exposure, performer reviews with patient the breath control to be used for exposure. Rechecks position.

a. Reminds patient if position is to be maintained for further cuts. Performer observes the patient's

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movement until the moment that the exposure is made. Readjusts position if warranted.

b. The performer returns to control room. Makes sure controls are properly set and patient is still in position or checks with anesthesiologist. Tells patient when to breathe as instructed by calling or using intercom. Performer initiates tubemount action and exposure by pressing hand trigger or exposure control button (twice if two stage control is appropriate). Holds down or continues to press exposure control until tube travel is completed. Then releases exposure switch at once.

   i) For asymmetrical exposure, initiates exposure or terminates at appropriate stage of tube travel.
   ii) After exposure is completed tells patient that he or she can breathe or tells anesthesiologist.
   iii) If there is any problem during the exposure, performer releases switch at once and sets back to "start" position before attempting another sweep.

c. After exposure performer returns to patient. Removes cassette from bucky.

   i) Removes any markers.
   ii) Performer places ID, R-L and appropriate next layer height marker on cassette for next scout (unless book cassette was used).
   iii) Inserts new cassette as described.
   iv) Changes fulcrum to new layer height (level) as appropriate,

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unless this will be done automatically.

v) If more than one patient position is to be used for scouts, repositions patient if appropriate.

vi) If new patient position is required that calls for change in exposure factors, or if a variety of factors are to be used, performer changes technical factors as appropriate.

vii) Performer adjusts collimation and shielding and repeats exposure for next scout tomogram.

viii) Performer continues until all scout tomogram exposures have been made.

d. Performer arranges to have the scout tomograms processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition. While films are being processed, makes sure that patient is comfortable and, if necessary, attended by staff person or self.

9. Performer brings the processed scout tomograms directly to the radiologist in charge or places on view boxes and informs radiologist that they are ready. May also hang prior films.

   a. Performer notes instructions from radiologist regarding the position, layer levels, amplitude, and number of cuts for each position for the nephrotomograms. Notes radiologist's preference for technical factors.
   b. If radiologist indicates that any radiographs are not technically adequate, performer notes reasons. If reason is due to performer's own negligence or lack of attention, notes so that performer can avoid future "retakes." If reason reflects malfunctioning equipment, performer reports malfunction to appropriate staff member. If reason reflects the preference for density or contrast of the radiologist, performer notes for future use.
   c. When the radiologist decides to proceed, performer notes radiologist's orders for postinfusion time sequence, use of compression, areas of interest, patient positions, pyelography. May note orders on amount of contrast or change of equipment or supplies and injection site. Makes any needed changes as appropriate. Performer may check to be sure what gonadal protection can be provided without interfering with diagnostic purpose of study.

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10. If performer is to assist with the infusion, proceeds as follows:

   a. Resets technical factors and equipment for first nephrotomogram as described, adjusting for patient's position, radiologist's orders after seeing scouts, selected amplitude and level, and use of contrast. Identifies cassette as appropriate and places in bucky as described.
   b. Washes hands observing sterile technique.
   c. May have IV bottle prepared with iodine-based contrast solution or decides to do personally. May check and see that contrast is at body temperature. May help set up IV infusion apparatus. Attaches bottle of prepared contrast solution to sterile IV tubing. Hangs at appropriate height on pole near patient with clamp in closed position.

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d. Performer may position patient on examination table as appropriate for introduction of contrast and first nephrotomogram. May have injection site prepared or decides to do personally. May place compression device for immediate use as appropriate. May reapply gonadal shielding if not already done.

e. Performer may provide emesis basin and clean towels.

f. Informs radiologist when patient and materials are ready for introduction of contrast solution. May support the arm used for injection site.

g. If appropriate, performer opens packet of sterile gloves for radiologist, observing sterile technique,so that wrapper, own hands, or other objects will not contaminate gloves.
May assist as appropriate by handing materials and supplies asked for.

h. Performer assists radiologist to care for patient if there is nausea or vomiting. Reassures patient. Cleans patient. May provide damp cold towel to alleviate flushing symptoms.

i. Notes time of start of infusion for later timing of pyelography.

j. Performer may periodically check that needle has not become dislodged and that the fluid is dripping at an even rate. If there are any problems, performer clamps tube and notifies an MD or RN at once.

k. When ordered,performer applies compression device over the lower ends of the ureters. Uses ureteric belt or compression block and band as appropriate. May provide pad under the pelvis.

l. If radiologist orders nephrotomograms during infusion process,performer proceeds as described earlier depending on the positions ordered. Is careful not to dislodge IV apparatus.

m. Keeps track of the time elapsed. If appropriate, makes sure that patient is in the care of a staff person who will observe patient's reactions or decides to do personally.

n. Performer stands by to assist radiologist or patient while infusion proceeds over the appropriate period of time and while IV apparatus is removed. Notes orders for timing of nephrotomography to follow.

11. Depending on radiologist's orders, performer makes tomographic exposures at the selected interval cuts (amplitude) and levels required for each position ordered, as described above:

a. Readjusts fulcrum level, technical factors, patient positioning, collimation,and shielding as appropriate. Makes sure ID, R-L, time elapse, amplitude and layer heights are marked. Makes exposures using the same breath control,and has tomograms processed at once as above.

b. Brings tomograms to radiologist and displays on view boxes as before.

c. Performer notes whether a given level will be further defined by smaller "slices" (expanded amplitude) within a more restricted area. If so, repeats procedures after adjusting amplitude and redetermining exposure techniques.

d. Throughout procedure performer remains alert for any symptom of severe pain or adverse reaction to the contrast. As soon as per-

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former judges that reaction may be severe, ceases procedure and notifies radiologist or attending physician at once.

e. Performer shows subsequent sets of tomograms to radiologist as processed, and proceeds as described above until radiologist indicates that tomographic examination is completed.
f. Performer refrains from commenting on the films to patient or providing any interpretation.
g. When radiologist indicates that tomography is completed, performer turns off energy for tomographic attachment and/or unplugs.

12. If performer is to continue with overhead pyelography, performer plans the overhead series as ordered.

    a. Plans to process each set of radiographs in series as soon as exposed and present to radiologist for review (to avoid unnecessary radiography and to permit radiologist to revise orders). Performer positions as follows or as described earlier, depending on radiologist's orders.
    b. For variations of supine AP projections (posterior views) of the kidneys and ureters, performer positions patient and centers as described earlier except as follows:

        i) Performer may direct central ray at 5° cephalad to the midpoint of film.
        ii) Performer may lower head end of table 15° to 20° and direct central ray at right angles to midpoint of film.

    c. Performer again checks [illegible]lity of patient to rel[illegible] peats appropriate breathing instructions or coordinates with anesthesiologist.

        i) Repeats orders for breath control and relaxation for same phase of respiration. If different phase is ordered from that planned for series, marks cassette accordingly.
        ii) Repeats appropriate collimation. Provides shielding and makes exposure as described above. Arranges processing.

    d. While films are being processed, performer makes sure that patient is comfortable and, if necessary, attended by radiologist, staff member or self.
    e. Places the films on view boxes as processed, in order, as they are taken. May hang tomograms and prior films. Informs radiologist as each processed film is ready for viewing.
    f. Performer notes radiologist's instructions after each film is reviewed. As appropriate, makes changes in timing, technical factors, patient positioning, projections, central ray and table angulation.
    g. When ordered, performer removes compression device. Releases pressure slowly to prevent visceral rupture.
    h. Notes any orders for delayed films and termination of procedure. May have radiologist fill out and/or sign requisition sheet.

13. When performer is told by radiologist that the examination has been completed, performer carries out termination steps for the examination:

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a. If not already done assists with removal of IV apparatus or has this done. b. Assists conscious patient to descend from table and walk to toilet, or provides bedpan for patient to void. If appropriate, moves x-ray tube and any protruding film holder away from patient before patient rises. May decide to assist patient from table. Makes sure patient is reminded of any footrest in stepping off table. c. For delayed films,performer may arrange to have patient taken to appropriate holding area. Keeps track of the time elapsed. If appropriate, makes sure that patient is in the care of a staff person who will transport to appropriate location and return patient at appropriate time. Takes delayed films as appropriate as described above. Brings to radiologist if appropriate. d. If patient has been anesthetized, checks with anesthesiologist on removal of patient. Otherwise, may have patient transported back to holding area or next location, or decides to do personally, as appropriate. If appropriate, makes sure that patient is in the care of a staff person who will transport to appropriate next location or, if out-patient, will arrange to discharge or send patient home (with escort if appropriate). e. Performer has equipment and examination table cleaned after use or decides to do personally, depending on institutional procedures. f. With tomographic attachment, disassembles by reversing the attachment procedures.	g. Performer records the examination according to institutional procedures. May include date, room, examination type, the views taken, the amplitude, speed, layer heights and technical factors used for tomograms, the film sizes; may record the number of exposures made including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet. h. May present requisition sheet to radiologist for comments, orders, and signature. i. Performer may decide to jacket films, requisition sheets, and related materials and/or have information recorded in log book personally,or have this done, depending on institutional procedures. j. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected and set for fluoroscopy,spot filming,overheads;scout taken as ordered;radiologist assisted with injection,puncture,positioning,fluoroscopy;overhead pyelograms taken as ordered,processed,presented,repeated as ordered;pt. returned;examination recorded;radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, medical-technical history,prior radiographs;phone; procedure tray for percutaneous renal puncture and injections,iodine-based contrast solution;heater; emergency cart;view boxes;pen;x-ray generator,control panels,tube,bucky,table,collimator;fluoroscopy unit,image intensifier,spot film device,TV monitor; cassettes;roll film;ID,R-L,breath control markers; labels,test tubes,lab jars with media,preservative; vertical cassette holder;sterile garments;emesis basin;towels;shielding;immobilization,compression devices;technique,standard view,tube rating,rad exposure charts;calipers;phantom or test object; stretcher;wheelchair;intercom;forms

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Non-infant pt. to have renal puncture procedure;radiologist;co-workers;accompanying adult;nurse

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking percutaneous antegrade or renal cyst pyelograms of non-infant pt. by reviewing request;preparing equipment and pt.;measuring;setting up for fluoroscopy,spot filming;taking scout films;assisting with infusion,puncture,injection procedures, fluoroscopy and spot filming;setting technical factors; identifying films;providing shielding;collimating; taking overheads as ordered;arranging for processing;taking to radiologist;continuing,repeating as ordered;having pt. returned;placing pyelograms for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient identification card, and any appropriate medical-technical history for a non-infant patient scheduled for percutaneous antegrade pyelography or renal cyst puncture (introduction of contrast directly into pelvocalyceal system of kidney(s) or into a cyst or tumor mass of the kidney by means of direct needle puncture) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Performer may also receive prior pyelograms, urograms, tomograms and/or ultrasound films.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, and to check the completeness of the information provided:

    a. Performer checks the examination called for and the purpose. Notes whether a scout film is ordered and any special requests. Notes which kidney is involved and/or whether bilateral views will be required.
    b. Notes the name of the radiologist in charge; may

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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note the name of the referring clinician and/or surgeon.

c. Performer reads patient's name, identification number, sex, age, weight, and height. Notes any special information or note on known pathology that could affect patient positioning, technique, or handling. Notes whether patient has prior history of allergies, results of any prior allergy test, adverse reaction to contrast.

d. Performer checks whether patient is suffering from a collateral condition requiring special handling such as heart disease, communicable or infectious condition, infirmity, incoherence. Notes whether patient will be on a stretcher or in a wheelchair. Notes whether patient will be accompanied by nurse or other staff person.

e. Notes orders for use or nonuse of ureteric compression. Notes which phase of suspended respiration will be required for overhead films. Notes the shielding appropriate for patient based on sex and positions ordered.

f. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete.

   i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether there is history of extensive radiography which should be reported to radiologist.

   ii) Checks whether any orders on exposure factors are in keeping with the usual rad exposure involved for the examination.

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   iii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.

   iv) Performer notes any orders for prior preparation of patient such as diet, medication, and/or sedation. May check whether these have been recorded as carried out; performer may check timing to be sure a proper elapse of time has occurred such as for sedation to take effect. If appropriate, arranges to have any omitted steps carried out with delay in examination or plans to notify radiologist.

g. If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer brings this to attention of radiologist in charge. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

h. If prior radiographs and/or ultrasonograms already on file are to be presented to radiologist, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

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2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary:

   a. Washes hands as appropriate.
   b. Checks that procedure tray has been prepared for the study involved or decides to do personally. Checks that materials are present for IV and percutaneous injections of contrast solution. May check for emesis basin and towels and supply of cold water. For antegrade pyelography checks for suture materials. For cyst puncture checks for sclerosing agent. Makes sure that emergency cart is present, that containers, preservative and labels for specimens (to be sent for bacteriologic culture and cytology examinations) are present.
   c. May check that contrast solution is at appropriate temperature or arranges to heat or cool.
   d. Checks that proper accessories are available for procedure including leaded rubber shielding for patient, and aprons and gloves to be used by radiologist, performer, and/or anyone who will remain in the room during exposure. Checks that appropriate immobilization devices are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient. May set up footboard at end of tilt-table, and attach hand holds.
   e. Makes sure that right (R) and left (L) markers are available for use, identification cards, or leaded numerals or markers, and markers to indicate time, position, or unusual breath control if appropriate.

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   f. For overhead filming performer makes sure that an upright cassette holder and an adequate supply of loaded cassettes and appropriate cassette holders are available in the examination room. Selects appropriate sizes, speed and type of film, grid and cassette combination based on standard institutional practices. If adequate supply is not in room, arranges to obtain or decides to obtain personally.
   g. Performer prepares for identification of overhead films using equipment provided by institution:

      i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.
      ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may type or write out ID information on card if not received with requisition.
      iii) Checks identification against requisition sheet.

   h. If examination will include spot filming using a camera (attached to image intensifier) and roll film, performer checks film supply indicator to make sure that there is sufficient film in the roll film cassette.

      i) If there is insufficient roll film in camera, performer arranges to have roll film cassette loaded, or decides to do personally.

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ii) When loaded roll film cassette is obtained, performer checks loading in subdued light. Checks that end of film is cut correctly and is properly threaded and attached to take-up spool so that film unwinds appropriately. Checks that film is properly engaged on sprockets. Locks into operating position. If appropriate, cuts off excess film at exit port and removes. Attaches film cassette to camera and locks into place. Replaces camera cover.

iii) If there is an adequate film supply, checks that film is properly loaded.

iv) Performer advances film to compensate for any exposure of film due to installation or check.

v) Removes dark slide from camera lens.

vi) If not already done, performer writes or types a card with patient's identification information for use with spot film device. Inserts in slot in spot film camera as appropriate.

i. If examination will include spot filming using a cassette/bucky spot film device, performer checks that there is an adequate supply of appropriate size cassettes in room.

i) If there is insufficient supply of cassettes, arranges to obtain or decides to obtain personally.

ii) Performer carries out identification of the spot film cassettes as for overhead films.

iii) Performer may use controls or manually pull out spot film bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position.

iv) If R-L markers are to be used with spot filming, performer tapes into place on image intensifier screen or plans to tape to patient's body.

j. If a grid will be used with the image intensifier for fluoroscopy and/or spot filming, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

3. Performer reviews technical exposure factors for overheads, fluoroscopy and spot filming, based on standards set by the institution for the examination:

a. Dons protective leaded rubber garments such as apron and gloves.

b. Makes sure that no one is in examination room or control room.

c. Performer reviews the technique chart(s) for the unit(s) to be used:

i) Locates information for the projections anticipated. Takes note of the exposure factors to be used for overheads, fluoroscopy, and spot filming. Considers preferences of the radiologist involved.

ii) Notes any newly posted changes in technical factors (to re-

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flect accommodation to a change in machine output or a policy decision).

iii) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs.

d. Performer makes sure that indicator light shows that x-ray generator is "warmed up" and ready for use. Makes sure that all circuits have been stabilized. If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

e. As appropriate, performer sets x-ray generator mode selector(s) for overhead scout film, for later use of fluoroscopic mode, and use of spot film camera or cassette device.

f. Performer sets controls on image intensifier for spot film camera or cassette device:

i) For spot film camera, performer selects and sets the rate (frames per second) for the camera according to standards set for examination.

ii) For cassette spot filming, performer may select and set a standard spot film program providing for format combinations such as single, half, or quarter combinations on a single cassette and related spot film sizes. Selects program appropriate for examination or awaits orders from radiologist.

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g. If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

h. If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

i. Performer selects and sets exposure factors for fluoroscopy:

i) Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination.

ii) If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved.

iii) Sets fluoroscopic examination timer to maximum position.

j. If appropriate, performer selects and sets exposure factors for spot filming:

i) For conventional manual exposure control, performer selects and sets the appropriate spot film time for the examination.

ii) For automatic, phototimed exposure control, performer selects a density exposure control appropriate for the examination.

iii) Performer selects the appropriate mA for the examination and the focal spot size to be used.

iv) Performer selects and sets kVp by combining settings on one

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major and one minor kVp selector as appropriate for the examination.

4. If not already done, performer returns to examination room to set up x-ray and fluoroscope tube(s), image intensifier, collimator and accessories, as appropriate, for check of equipment prior to examination:

   a. Makes sure that no one is in room.
   b. Places phantom or appropriate test object on radiography table where patient's area of interest will be centered for examination.
   c. Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.
   d. If not already done, moves image intensifier and any spot film device into position; centers (over or under) the area of interest.
   e. Performer adjusts the x-ray tube to appropriate focal spot-object distance (target to object distance, (TOD). For fluoroscopy adjusts distance between focal spot and image intensifier (focal spot to film distance, FFD). Makes sure that TOD is 15 inches or more. Operates controls or manually moves the x-ray tube(s) into place. Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD is obtained.
   f. Performer collimates fluoroscopy tube (and x-ray tube used for spot filming if different), depending on nature of the equipment and controls:

      i) Adjusts fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or sets shutter mode selector to automatic collimation.
      ii) Manually sets collimator for the spot film field size to be used, or selects and sets field size control to be used for automatic collimation with programmed spot film cassette exposure sequence.

5. If not already done, performer checks functioning of fluoroscopy equipment by entering remote control room or operating controls in examination room behind leaded screen:

   a. To check fluoroscopy mode, performer turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.

      i) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.
      ii) Checks mA meter and notes whether appropriate reading is obtained.
      iii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.
      iv) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

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b. To check spot film functioning, performer may move cassette or roll film into x-ray exposure field using appropriate controls.

   i) Performer activates controls for spot film exposure. Notes whether cassette or roll film transport is operating appropriately. Notes whether exposure is terminated by phototimer or, if manual timer, in time set. If appropriate, releases spot film control after exposure.
   ii) If equipment is operating appropriately, performer unloads cassette and reloads or advances roll film as appropriate. Moves bucky out of way until fluoroscopy is completed.

c. After equipment has been checked performer resets the standard preliminary exposure factors. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

6. Performer readies patient for examination by radiologist:

   a. Performer washes hands as appropriate. Depending on patient's condition, may decide to arrange for or carry out isolation or decontamination techniques.
   b. Performer has the patient called from the holding area and prepared for the examination (if not already done), or decides to do personally.
   c. Depending on institutional arrangements, performer may decide to escort patient; may decide to assist in transporting patient from holding area or have this done.
   d. Performer greets patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet. Refers to hospital identification bracelet or other identifier. If patient is accompanied because of seriousness of condition, performer checks with accompanying staff member on any special precautions necessary during procedure.
   e. If not already done, has patient's clothing removed and provides gown or drape. May assist patient or request assistance from nurse. Permits patient to keep covered with gown until measurements are taken and until exposure. Treats young patient with as much courtesy as adult.
   f. If patient is to be examined in erect position, performer adjusts vertical film holder to appropriate height for patient.
   g. Performer has patient assume a comfortable recumbent prone or seated position, as appropriate.

      i) If appropriate, places mattress, pillow or clean linen on x-ray table. May place pad, blanket or pillow under bony prominences to provide comfort for recumbent patient.
      ii) If patient is in wheelchair may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.
      iii) Performer may decide to assist patient from wheelchair or stretcher to table or has this done. May obtain help.

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Makes sure that no equipment is in the way that may be collided with by patient.

iv) If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.

v) If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table. May arrange to move or have patient moved to table.

h. If not already done, performer questions patient or accompanying adult about any preparatory procedures ordered.

i) If not already done, questions patient or accompanying adult about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

ii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

iii) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist at once and proceeds only with approval.

i. If not already done, performer explains to patient what will be involved in the procedure:

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i) Performer explains what cooperation will be asked of patient. Describes injection procedures for contrast and what radiologist will be doing. Indicates what types of positions the patient will be asked to assume. Describes any probable breathing control, any use of compression devices, as appropriate. May demonstrate how tilt table will be used and reassure patient that he or she will be held safely.

ii) Performer may explain to patient that side effects may be felt from IV injection of contrast medium such as feeling of nausea, flushing, choking sensation. Reassures patient that vomiting is normal and that emesis basin will be provided.

iii) Performer encourages patient to relax. Rehearses patient in suspending respiration (inhalation and/or exhalation) and relaxing. Performer may check patient's relaxation by keeping hand on patient's back to detect tenseness. Performer may judge time interval needed after cessation of respiration for patient to relax and plan to adjust exposure timing accordingly.

iv) Performer answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Remains aware that patient may be frightened and/or in pain. Performer explains, when asked medical

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questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

j. Unless measurements have already been made, performer uses centimeter calipers to measure the thickness of the abdomen at the level of the kidneys in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film.

  i) Performer evaluates the patient's bodily habitus to estimate the position of the kidneys and variations in location between recumbent and erect positioning.
  ii) Notes whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points are easy to find, whether extremities are of unequal length.
  iii) Records measurements for determining exposure factors for overheads.

k. Performer may tape R or L marker to patient if appropriate for use in spot filming.
l. If not already done, performer may have patient empty bladder. Has patient void in bathroom or provides bedpan. May decide to assist patient.
m. Has patient relax on table in appropriate position for examination or for scout film depending on whether orders require that a scout film be made before the radiologist's examination.

7. If a scout film is ordered prior to radiologist's examination, performer arranges to make scout film at this point, as described below in later steps, and have processed at once. Otherwise awaits radiologist's orders.

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8. Performer informs attending radiologist when patient is ready to be examined. Brings requisition sheet, patient's medical history, chart, scout film (if already done) and any prior radiographs and ultrasonograms to radiologist. Displays radiographs on view boxes.

a. If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist.
b. Performer may accompany radiologist to examination room and introduce patient to radiologist.
c. During radiologist's review of requistion, prior radiographic materials and examination of patient, performer notes radiologist's orders:

  i) If radiologist decides to terminate procedure, performer proceeds to termination steps described below. If appropriate, arranges to have proper forms filled out.
  ii) If radiologist decides that additional preparatory steps are needed, performer may arrange to have these carried out and/or performer arranges to reschedule patient.
  iii) If appropriate, performer may receive orders from radiologist for scout film. Notes patient position, projection

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and centering ordered or plans to carry out standard procedure.

9. When a scout film of abdomen or kidneys is ordered, performer proceeds as follows:

   a. Performer selects and sets the technical factors for the scout film:

      i) Consults the technique chart posted for the machine. Locates the information needed for the body part and projection involved according to the centimeter thickness of the part and position as measured and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed and use of other accessories (such as screens, grids, bucky, etc.).
      ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.
      iii) Once the standard kVp, mA and time have been determined, performer makes any conversions necessary to account for extreme fat or muscularity, age, the preference of the radiologist involved, and any other conversion needed such as posted changes. Performer looks up numerical conversion factors and calculates or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.
      iv) Sets control for radiography mode.
      v) For conventional exposure control, performer sets the milliamperage selected for the correct focal spot size. Sets the selected exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.
      vi) For automatic phototimed exposure control, performer sets the category corresponding to the type of study and use of screens, bucky, etc., and, if appropriate, focal spot size. Sets a control corresponding to the selected field size (as listed on technique chart for phototiming). May set a kVp range button, if called for with equipment, corresponding to the appropriate kV range for the examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

   b. Performer obtains the appropriate size loaded cassette for the scout projection. Attaches identification information to the cassette or table top:

      i) Places right or left marker on film holder or table-top as appropriate or depresses appropriate R or L button for automatic marking.
      ii) If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.

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iii) If patient identification information is to be entered by use of flasher, sets flash card aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.

iv) Performer may place patient's card into card tray for equipment using automatic film marking device.

v) Performer places cassette in bucky. May manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

c. Performer positions patient as follows (or as described below for later steps) depending on the position ordered. May explain or demonstrate to patient what is required. May obtain help in positioning.

d. For a prone PA projection (anterior view) of the kidneys or abdomen, performer notes whether scout is to be centered to the estimated level of the kidneys or to the iliac crests.

i) Has patient lie in prone position on table with median sagittal plane of body centered to the midline. Has patient flex elbows, place arms in a comfortable position. Supports ankles. Rests patient's head on cheek or chin. May have patient rest hands beneath chest. May support head and upper chest. Arranges shoulders and hips to lie on single transverse planes.

ii) Depending on orders, centers cassette to the level of the iliac crests (for abdominal film) or at estimated level of kidneys at about the third lumbar body, or as estimated from prior films.

iii) Directs central ray at right angles to midpoint of film.

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e. For a supine AP projection (posterior view) of abdomen or kidneys, performer aligns patient in supine position, with the median sagittal plane of the body centered to the midline of the table.

i) Elevates patient's shoulders and knees so that patient's back is in contact with table. Supports. Adjusts shoulders and hips so that they lie on single transverse planes. May immobilize ankles. Has patient flex elbows and abduct arms.

ii) Performer centers the cassette to the estimated level of the kidneys or to the iliac crests unless otherwise specified. Makes sure not to use visual points of muscle or fatty tissue and palpates for the crest of the bone.

iii) Directs central ray at right angles to the midpoint of the film.

f. For variations of supine AP projections (posterior views) of the kidneys and ureters, performer positions patient and centers as described earlier except as follows:

i) Performer may direct central ray at 5° cephalad to the midpoint of film.

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- ii) Performer may lower head end of table 15° to 20° and direct central ray at right angles to midpoint of film.

g. Performer avoids applying direct pressure to abdomen unless ordered.

h. Checks whether patient is able to relax as positioned and immobilized. If not, performer readjusts and recenters until patient is comfortable.

i. Performer rehearses patient in breathing in, breathing out fully, and holding breath while remaining relaxed until told to breathe again (or in suspended inhalation if so ordered).

j. Performer sets the focal-film distance if not already done as appropriate. Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD (TFD) is obtained.

k. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. Adjusts the collimator so that a small unexposed border will appear around the edge of the film or collimates further so as to expose only the area of interest (and thus provide maximum protection and detail). For small field may attach auxiliary extension cone to collimator to further reduce primary beam. Adjusts primary beam to minimum size needed to cover the area(s) of interest.

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l. Performer adds lead shielding to areas that will be in the primary path of the beam but are not included in the areas of interest, especially gonads. Provides patient and anyone who will remain in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

m. When everything is ready for the exposure, performer reminds patient of the breath control to be used for exposure. Encourages patient to relax. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

n. Performer returns to control room for exposure.

- i) Makes sure controls are properly set for radiography mode and that patient is still in position.
- ii) Tells patient when to take a deep breath and exhale and hold still while relaxing or as rehearsed, by calling or using intercom.
- iii) When respiration has been suspended, performer waits one or two seconds to allow involuntary movement of viscera to subside and then makes exposure or waits number of seconds judged necessary for patient to relax.
- iv) Performer initiates exposure by pressing hand trigger or exposure control button.
- v) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

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- vi) May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction may decide to report; anticipates need to repeat exposure.
- vii) With phototimer notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure.
- viii) After exposure is completed tells patient that he or she can breathe.
- ix) If the exposure is terminated by a circuit breaker, rechecks technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.
- x) After exposure removes cassette and removes markers for further use.

o. Performer arranges to have the scout film processed at once or decides to do personally.

- i) Attaches ID card for use with flasher if appropriate. May sign requisition.
- ii) While film is being processed and/or evaluated performer has patient relax in examination room or holding area. Explains what will happen next. If appropriate, makes sure that patient will be attended while waiting.
- iii) If appropriate, moves x-ray tube and any protruding film holder away from patient before patient rises. May decide to assist patient from table. Makes sure patient is reminded of any footrest in stepping off table.

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p. Performer places processed scout film on view box. May display prior films as well. Informs radiologist that scout is ready.

- i) Performer notes whether radiologist requires a change in technical factors and/or patient positioning or centering for later overhead filming.
- ii) If radiologist indicates that the scout film is not technically adequate, notes whether this is due to performer's own negligence or lack of attention so that performer can avoid future "retakes." If request for change reflects malfunctioning equipment, performer reports malfunction to appropriate staff member. If request for change reflects the preference for density or contrast of the radiologist, performer notes for future use.

10. If radiologist decides to proceed with examination performer notes orders for sequence and timing of steps and orders for equipment or materials:

- a. May discuss sequence and timing for procedure.
- b. For antegrade pyelography, notes whether there will be an IV injection of contrast.
- c. May note orders on amount of contrast to prepare in syringes, orders for changes in materials. Arranges to provide or change any equipment or supplies as ordered by radiologist.

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d. Notes radiologist's orders for program and settings for spot filming, and sets or resets as appropriate. May arrange signals for exposure, changing of spot film cassettes, operation of exposure controls.

e. Changes or adjusts technical factors and settings as appropriate for fluoroscopy and spot filming. Performer may check to be sure what gonadal protection can be provided without interfering with diagnostic purpose of study.

11. If performer is to assist with injection of contrast medium, washes hands, observing sterile technique as appropriate. May proceed as follows:

a. If not already done, may have syringes prepared with contrast medium (iodine based solution) or decides to do personally.

b. Performer may position patient on examination table as appropriate for introduction of contrast. May have injection site prepared or decides to do personally.

c. May provide emesis basin and clean towels.

d. Informs radiologist when patient and materials are ready for injection of contrast solution.

e. Performer gives radiologist leaded apron and appropriate sterile garments. If appropriate, opens packet of sterile gloves for radiologist, observing sterile technique, so that wrapper, own hands, or other objects will not contaminate gloves.

f. May assist as appropriate by handing materials and supplies asked for.

g. After IV injection, performer assists radiologist to care for patient if there is nausea or vomiting. Reassures patient. Cleans patient. May provide damp cold towel to alleviate flushing symptoms.

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h. If so ordered, performer may apply ureteric compression and/or lower head end of table.

i. If appropriate, notes time of injection and interval judged by radiologist for contrast to reach kidney. If so ordered, performer notes when appropriate interval has elapsed, and makes scout film as described, or indicates to radiologist when interval has passed and assists radiologist with fluoroscopic viewing, as described below in later step.

j. If performer is to take scout film after injection of contrast, sets technical factors as described, adjusting for use of contrast material and any changes ordered if a preinjection scout film has already been made. Repeats appropriate steps and presents to radiologist for review as described above.

k. Performer notes radiologist's final orders on technical factors, patient position, materials, puncture site and amount of contrast for percutaneous injection.

l. Throughout procedure performer remains alert for any symptom of severe pain or adverse reaction to the contrast. As soon as performer judges that reaction may be severe, ceases procedure and notifies radiologist or attending physician at once.

12. Performer assists with percutaneous renal puncture as follows:

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a. Arranges to have patient prepared for puncture by having patient lie in prone position on table.

b. Performer gives leaded gloves and apron to radiologist if not already done. If appropriate, places leaded curtain in place. If not already done, provides patient and everyone remaining in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

c. Washes hands, observing sterile technique as appropriate.

d. May assist as appropriate by handing materials asked for such as in local anesthetization of patient.

e. On signal from radiologist, performer may dim room lights. Turns on TV power switch. May go to control room and operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders until visualization is adequate.

f. Performer may operate tilt table on orders from radiologist, or assist in positioning patient as ordered.

g. Performer repeats as appropriate while radiologist places needle, tests for proper placement of needle under fluoroscopic control.

h. Performer may assist as radiologist aspirates urine from kidney or cyst fluid from renal cyst. May decide to assist radiologist in transferring fluid from syringe to sterile, labeled containers; performer may cap and arrange to send for laboratory testing, or has this done.

i. Performer may assist while radiologist tapes or sutures tube to teflon sheath for introduction of contrast (antegrade pyelography) or while radiologist closes puncture needle and prepares for introduction of air and positive contrast (cyst puncture).

13. Performer may assist with spot filming as radiologist injects contrast:

    a. Operates exposure controls as ordered or positions table, tube, or patient as ordered.

    b. If spot film attachment uses cassettes, performer may unload as used, identify, and insert additional cassettes, as described above, throughout procedure.

    c. Depending on institutional procedures, performer may keep radiologist informed of cumulative exposure as shown on fluoroscope timer indicator.

    d. Performer may arrange to have spot films processed as they are taken or as ordered.

        i) With cassette spot films, removes any markers for further use. Attaches ID card for use with flasher if appropriate.

        ii) With spot film camera, performer advances the film so that all exposures made will be wound on the take-up spool in the roll film cassette. Uses device to cut film and create a light shield. Resets counter and removes film cassette.

        iii) Performer brings the processed spot films directly to the radiologist or places on view boxes and informs radiologist that they are ready. May hang prior films and scouts.

        iv) Changes technical factors as ordered and assists with any continued fluoroscopy and spot filming as described until

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radiologist indicates fluoroscopic examination is completed.

14. If so decided for renal cyst puncture, performer may assist radiologist with injection of sclerosing agent, removal of puncture needle, and dressing of puncture site.

15. If radiologist decides to order post-injection radiographs, performer notes the centering, patient positions, views and breath control ordered, whether bilateral views are required. For antegrade pyelography waits or assists while radiologist removes syringe and closes off tube.

    a. Performer may discuss what movement is possible to determine the positions available for use, or performer may assist while radiologist positions patient for overheads.
    b. Performer resets technical factors as appropriate for each projection to account for use of contrast and patient position.
    c. If centering has not been indicated by radiologist, performer judges the location of the kidneys based on puncture site and prior films. Plans to adjust for higher centering for supine positions and obese, hypersthenic patients, and lower centering for erect positioning and thin, asthenic patients. Centers higher for left kidney than for right.
    d. Performer continues to remain alert for any symptom of emergency or adverse reaction. As soon as performer judges that reaction may be severe, ceases exposure and notifies radiologist at once.

16. Performer positions patient for overhead views of kidney(s) as follows, or

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as described earlier, depending on the position(s) ordered:

a. For PA oblique projections (anterior oblique views) of the kidneys, performer positions prone patient with coronal plane of the upper lumbar vertebrae on the side of interest centered to the midline.

    i) Has patient rest head on cheek on side of interest with arm alongside body.
    ii) Rotates body so that opposite side is elevated 45°. Has patient support himself or herself on opposite side forearm and flexed knee.
    iii) Centers film to puncture site or as ordered.
    iv) Directs central ray at right angles to midpoint of film.
    v) For bilateral study reverses position for view of opposite side.

b. For a lateral decubitus projection of the kidneys, performer uses a vertical bucky or cassette holder with patient lying on table. Notes whether PA or AP projection is required.

    i) Has patient lie on side of interest with opposite side supported and film placed vertically in front of patient with tube positioned horizontally behind (for PA projection) or the reverse (for AP projection).
    ii) Centers cassette to the area of the kidneys.
    iii) Has patient flex knees comfortably. Places supports under and between knees and ankles. Has patient flex elbows, place lower

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hand under head, and has patient grasp side of table with opposite hand. Elevates the torso.

- iv) Maintains patient in position long enough for fluid levels to be accurately demonstrated.
- v) Directs central ray horizontally at right angles to midpoint of film.

c. For an erect frontal projection of the kidneys and ureters, performer notes whether an AP projection (posterior view) or PA projection (anterior view) is ordered.

- i) Has patient stand facing vertical cassette holder for PA projection and with back to holder for AP projection. Centers median sagittal plane of body to midline. Has patient distribute weight evenly. Supports shorter limb if limbs are of unequal length.
- ii) Adjusts head and spine to a single median sagittal plane, with shoulders in a single transverse line. Has patient flex elbows and place hands on upper chest.
- iii) Centers cassette to level of the kidneys, adjust for change to erect positioning.
- iv) Maintains patient in erect position long enough for fluid levels to be accurately demonstrated.
- v) Directs central ray horizontally at right angles to midpoint of film.
- vi) For patients who cannot assume erect position, performer adjusts patient in semierect position by starting with supine or prone position. Attaches footrest to end of table and secures patient. With patient on table, performer moves it to almost vertical position. Centers as above with cassette in vertical bucky. Directs central ray horizontally to the midpoint of the film, regardless of the angulation of the table.

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d. Performer repeats shielding and collimation steps as appropriate as described above. Attaches an auxiliary extension cone to collimator to further reduce the primary beam.

e. Performer again rehearses patient in relaxing and suspended exhalation (and/or suspended inhalation if so ordered) while remaining relaxed.

f. Performer makes exposure as described earlier, waiting a few seconds after suspension of respiration.

17. Performer arranges for processing and review of each overhead view as taken:

a. May sign or have radiologist sign requisition sheet.

b. Checks that equipment is turned off.

c. Removes any markers for further use. Attaches ID card for use with flasher if appropriate.

d. Performer has overheads processed at once or decides to process personally.

e. While films are being processed, makes sure that patient is comfortable and, if necessary, attended by radiologist, staff member, or self.

f. Performer shows each pyelogram to radiologist as processed.

- i) Notes orders for change in technical factors, change in patient

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positioning, centering and/or tube angulation.

- ii) Notes any decision by radiologist to inject more contrast, and repeats any portion of the procedure as appropriate.
- iii) If radiologist requires additional centering and/or positions, performer repeats overhead filming as appropriate to new projections, as described above.
- iv) Performer shows subsequent radiographs to radiologist as processed and proceeds as described above until radiologist indicates that radiography is completed.

g. When ordered, performer removes any compression device in place. Releases pressure slowly to prevent visceral rupture.

18. When performer is told by radiologist that the examination has been completed, performer carries out termination steps for the examination:

  a. With antegrade pyelography performer may assist radiologist with removal of contrast by operating tilt table as ordered and assisting with fluoroscopic check as described above.

    - i) May assist with removal of teflon sheath, and dressing or securing of sheath and collection bag by supplying or handing materials needed, using sterile technique.
    - ii) If appropriate, may assist with arrangements to have patient taken to surgery.

  b. Performer may have patient cleansed. Removes any markers from patient's body.

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  c. Performer may have patient transported to room, recovery area, or to appropriate next location (such as surgery), or decides to do personally, as appropriate. If appropriate, makes sure that patient is in the care of a staff person who will transport to appropriate next location.

  d. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed to avoid infection or contamination, or decides to do personally, depending on institutional procedures.

  e. May present requisition form to radiologist for comments and signature. May have radiologist fill out requisition sheet for medication.

  f. May check that all samples have been prepared for laboratory, are properly identified, or decides to do personally. May present lab order forms to radiologist for signature.

  g. Performer records the examination according to institutional procedures. May include date, room, examination type, any overhead views taken, the technical factors used, and film sizes. Performer may record the number of exposures made of each spot film and overhead view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.

  h. Performer may record the fluoroscopy examination including exposure time and rad dosage.

  i. Performer may decide to jacket radiographs, requisition sheets,

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and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. j. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured;scout taken; technical factors selected and set;physician assisted with catheterization,infusion or injection of contrast through catheter;pre-voiding,voiding,post-voiding cystograms taken as ordered,processed,presented;pt. returned;examination recorded;cystograms placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, medical-technical history,prior radiographs;phone; view boxes;pen;sterile garments;x-ray generator,control panels,tube,bucky,table,collimator;ID,R-L,cc markers;rapid cassette changer;specimen container, labels;urine receptacles;procedure tray with materials for catheterization,IV drip or syringe instillation;iodine based contrast solution;pediatric platform,voiding stool,automatic exposure device;emergency cart;clock;extension cones;stool;calipers; vertical cassette holder;shielding;heating device; immobilization devices;waterproof table covering; technique,standard view,tube rating and rad exposure charts;cassettes;forms;intercom;stretcher;wheelchair

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(✓) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Pt. to have cystography;accompanying adult;radiologist,urologist,or gynecologist;co-workers;nurse

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking cystograms and voiding cystourethrograms of any patient,by reviewing request;preparing pt. and equipment;taking scout;assisting with catheterization and injection or infusion of contrast through catheter;setting technical factors;identifying film; positioning pt.;providing shielding;collimating; taking pre-voiding,voiding and post-voiding cystograms as ordered;arranging processing;presenting for review as taken and continuing as ordered;having pt. returned;placing cystograms for use;recording.

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Performer receives or obtains the x-ray requisition form, patient identification card, and any appropriate medical-technical history for a patient scheduled for retrograde cystography (radiographic contrast study of lower urinary tract after passage of a urethral catheter) such as cystography (study of bladder), cystoureterography (ureters and bladder), voiding cystourethrography (bladder and urethra during micturition), prostatography (prostate gland) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Performer may also receive prior scouts, urograms, and/or record of exposure technique(s) used and/or any changes necessary.

Depending on institutional procedures, performer may carry out cystography after preliminary cystoscopy under directions of gynecologist or urologist, and/or patient may be brought to radiology department already catheterized, or patient may be catheterized as part of procedure.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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considerations, and to check the completeness of the information provided:

a. Performer checks the examination called for and the purpose. Notes whether a routine scout film is ordered and any special requests. Notes whether ureters, bladder, urethra and/or prostate gland is to be studied, whether voiding cystourethrography is called for.
b. Notes if performer is to join a urologist, gynecologist or radiologist; physician's name; location of examination room. If the examination is to be carried out in radiology department, notes whether patient will already have been catheterized. Notes whether contrast will be infused, or injected by syringe into bladder.
c. Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is in-patient, out-patient, or emergency patient. Notes any special information or note on known pathology that could affect patient positioning, technique, or handling. Notes whether patient has prior history of allergies, results of any prior allergy test, any adverse reaction to contrast.
d. Performer checks whether patient is suffering from a collateral condition requiring special handling such as heart disease, communicable or infectious condition, infirmity, incoherence. Notes whether patient will be on a stretcher or in a wheelchair. Notes whether patient will be accompanied by nurse or other staff person.
e. If patient is infant, may note feeding schedule and any special orders for preparation of bottle with formula for use during procedure. Notes whether an automatic device for infant voiding cystourethrography will be used and/or special radiolucent platform for positioning patient.
f. Notes orders for use or nonuse of ureteric compression device. Notes which phase of suspended respiration is to be used. Notes shielding appropriate for examination based on sex, age and positions ordered.
g. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

    i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done elsewhere in recent past, whether history of extensive radiography should be reported.
    ii) Checks whether any special orders on exposure factors are in keeping with the usual rad exposure involved for the examination.
    iii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.
    iv) Performer notes any orders for prior preparation of patient such as diet, use of cleansing enemas, and/or sedation. May check whether these have been recorded as

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carried out; performer may check timing to be sure a proper elapse of time has occurred such as for sedation to take effect. If appropriate, arranges to have any omitted steps carried out with delay in examination, or plans to notify physician in charge.

h. If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer brings this to attention of the physician in charge. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.
i. If prior radiographs already on file are to be presented to the physician, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. Performer goes to appropriate room in the department for the type of examination involved and the equipment required, or goes to room assigned on requisition sheet where performer is to join urologist or gynecologist. May prepare ahead so as not to keep patient in examination room longer than necessary.

    a. Washes hands as appropriate.
    b. Checks that procedure tray has been prepared for the study involved or decides to do personally:

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        i) If patient is to be catheterized in room, checks that appropriate materials are present for patient's sex and age.
        ii) Checks that appropriate contrast solution is present and proper equipment for instillation (injection or infusion via urethra). May check that contrast solution is at appropriate temperature; may arrange to heat or cool.

    c. Makes sure that emergency cart is present.
    d. Performer makes sure that examination table is provided with disposable and/or waterproof underpadding or decides to provide personally. With voiding study checks for proper collection equipment for urine depending on patient's age.
    e. Checks that proper accessories are available for procedure including leaded rubber shielding to be used by the performer, the patient, and anyone who will remain in the room during exposure. If appropriate, arranges to have a bottle prepared for infant patient. Checks that appropriate equipment is present for filming during voiding, and the proper immobilization devices appropriate for the patient's age, sex and institutional practices. Checks that there is a mattress, pads, pillows and/or blankets for comfort of patient on examination table.
    f. May set up footboard at end of tilt-table, and attach hand holds. Pulls out extension leg rest if

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appropriate. May set up examination platform for infant patient and make sure that it is warm.

g. Makes sure that right (R) and left(L) markers are available for use, identification cards, or leaded numerals or markers, markers to indicate post-infusion time intervals, special positions or cc quantities injected.

h. Performer makes sure that upright cassette holder and an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Selects appropriate speed and type of film, grid and cassette combination depending on the techniques to be used and standard institutional practices. Selects size based on patient's size and area of interest. If adequate supply is not in room, arranges to obtain or decides to obtain personally.

i. Performer prepares for identification of overhead films using equipment provided by institution:

   i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.
   ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may type or write out ID information on card if not received with requisition.
   iii) Checks identification against requisition sheet.

j. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

k. Performer checks that x-ray equipment is ready for use. Goes to control panel and checks that indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for the machine to "warm up." If appropriate, performer may set radiography mode selector and set collimator control for manual operation. Makes sure that all circuits have been stabilized.

l. Performer may note whether a preliminary scout film has already been made of the patient (done earlier and/or by another radiologic technologist).

   i) If a scout film has already been made and viewed by radiologist, performer notes the technique used or ordered and plans technical factors adjusting as appropriate.
   ii) If a scout film has been made but not approved, performer places processed scout film and any prior films with patient's chart or places on view box for review by the physician in charge.
   iii) If a scout film has not been made and is required before patient is seen by the physician in charge, performer plans to proceed after readying patient as described later, below. Otherwise awaits orders by physician.

3. Unless performer is to join urologist or gynecologist after cystoscopy is

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underway, performer readies patient for examination by radiologist or other physician:

a. Performer washes hands as appropriate. Depending on patient's condition, may decide to arrange for or carry out isolation or decontamination techniques. Dons lead protective garments, and sterile gown, mask, and gloves if appropriate.

b. Performer has the patient called from the holding area and prepared for the examination (if not already done), or decides to do personally.

c. Depending on institutional arrangements, performer may decide to escort patient; may decide to assist in transporting patient from holding area or have this done. If carrying infant makes sure to follow proper sanitary procedures and to carry infant supporting head as appropriate. If patient has already been catheterized is careful not to dislodge catheter.

d. Performer greets non-infant patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet. Refers to hospital identification bracelet or other identifier. If patient is accompanied because of seriousness of condition or age, performer checks with accompanying staff member on any special precautions necessary during procedure.

e. If not already done, has patient's clothing removed and provides gown or drape. May assist patient or request assistance from nurse. Permits patient to keep covered with gown until measurements are taken and until exposure. Treats young patient with as much courtesy as adult.

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f. Performer has patient assume a comfortable recumbent supine or seated position, as appropriate.

   i) If appropriate, places waterproof or disposable mattress, pillow or clean linen on x-ray table. May place pad, blanket or pillow under bony prominences to provide comfort for recumbent patient.
   ii) If patient is in wheelchair may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.
   iii) Performer may decide to assist patient from wheelchair or stretcher to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.
   iv) If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.
   v) If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table. May arrange to move or have patient moved to table.
   vi) If patient is an infant may place on special warmed platform. May have patient immobilized or decides to do personally. If appropriate, soothes patient, supplies bottle or pacifier.

g. If patient is to be examined in erect position, performer adjusts vertical film holder to appropriate height for patient.

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h. If not already done, performer questions patient or accompanying adult about any preparatory procedures ordered.

  i) If not already done, questions patient or accompanying adult about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).
  ii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.
  iii) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs physician in charge at once;proceeds only with approval.

i. If not already done, performer explains to non-infant patient what will happen during the procedure:

  i) Describes catheterization (if not yet done), instillation of contrast and what physician will be doing. If voiding study is ordered, tries to relieve patient's embarrassment. Assures patient that privacy will be provided by closed door, exclusion of unauthorized staff, and use of gown or drape. With child may rehearse the process.
  ii) Performer explains what cooperation will be asked of patient. Indicates that patient will empty bladder prior to examination. Indicates what types of positions the patient will be asked to assume. Describes any probable breathing control, any use of compression devices, as appropriate. May demonstrate how tilt table and positioning will be used and reassure patient that he or she will be held safely.
  iii) Performer encourages non-infant patient to relax. Rehearses patient in suspending respiration (inhalation and/or exhalation) and relaxing. Performer may check patient's relaxation by keeping hand on patient's back to detect tenseness. Performer may judge time interval needed after cessation of respiration for patient to relax and plan to adjust exposure timing accordingly.
  iv) Performer answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Remains aware that patient may be frightened and/or in pain. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

j. Unless measurements have already been made, performer uses centimeter calipers to measure the thickness of the abdomen and pelvis at appropriate levels in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film.

  i) Notes whether the area of interest is heavily covered by muscle or soft fat, whether

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the palpation points are easy to find, whether extremities are of unequal length.

ii) If performer believes that patient will be embarrassed by palpation of the symphysis pubis, uses the most prominent point of the greater trochanter to locate the same transverse plane.

iii) Records measurements for determining exposure factors for overheads.

k. If not already done, performer may have non-infant patient empty bladder. Has patient void in bathroom or provides bedpan. May decide to assist patient.

l. Has patient relax on table in appropriate supine position for examination, catheterization, or for scout film,depending on whether orders require that a scout film be made before the physician's examination.

m. If a scout film is ordered prior to physician's examination, performer arranges to make scout film at this point, as described below in later steps; plans to have processed at once. Otherwise awaits orders.

4. Unless already done, performer informs attending physician in charge when patient is ready to be examined.

   a. Brings requisition sheet, patient's medical history, chart, any processed scout film and any prior films. Displays radiographs on view boxes.

   b. If not already done, performer tells physician about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to physician's attention. Notes any special orders or change in procedure decided.

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   c. Performer may accompany the physician to examination room and introduce patient to physician.

5. If not already done, performer awaits and carries out orders for scout film. Plans AP supine projection of pelvis or abdomen or as ordered. Notes orders for centering or follows standard procedure:

   a. Performer selects the technical factors for the scout film:

      i) Consults the technique chart posted for the machine. Locates the information needed for the body part and projection involved according bo the centimeter thickness of the part and position as measured and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed and use of other accessories (such as screens, grids, bucky, etc.).

      ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.

      iii) Once the standard kVp, mA and time have been determined, performer makes any conversions necessary to account for extreme fat or muscularity, age, the preference of the physician involved, and any other conversion needed such as posted changes. Performer looks up numerical conversion factors and calculates or uses conversion charts to ascertain the appropriate new exposure fac-

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tor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.

iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs.

b. Performer sets the exposure factors as selected:

- i) Sets controls for radiography mode.
- ii) If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.
- iii) For conventional exposure control, performer sets the milliamperage selected for the correct focal spot size. Sets the selected exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.
- iv) For automatic phototimed exposure control, performer sets the category corresponding to the type of study and use of screens, bucky, etc., and, if appropriate, focal spot size. Sets a control corresponding to the selected field size (as listed on technique chart for phototiming).
  May set a kVp range button, if called for with equipment, corresponding to the appropriate kV range for the examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.
- v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustments of table, tube height or position, and collimator.

c. Performer obtains the appropriate size loaded cassette for the first (or next) scout projection. Attaches identification information to the cassette or table top:

- i) Places right or left marker on film holder or table-top as appropriate or depresses appropriate R or L button for automatic marking.
- ii) If patient's identification information is in the form of lead numerals or marker, performer places on appropriate corner of cassette.
- iii) If patient identification information is to be entered by use of flasher, sets flash card aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
- iv) Performer may place patient's card into card tray for equipment using automatic film marking device.
- v) Performer places cassette in bucky. May manually pull out bucky tray and open retaining clamps. Inserts cassette into

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bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

d. Performer positions patient as follows (or as described below for later steps) depending on the position ordered. May explain or demonstrate to patient what is required. May obtain help in positioning. May have infant immobilized on special platform;if so, positions cassette underneath.

e. For a supine AP projection (posterior view) of abdomen or pelvic area, performer aligns patient in supine position, with the median sagittal plane of the body centered to the midline of the table.

i) Has patient extend legs so that anterior pelvic bones are tilted downward.

ii) Adjusts shoulders and hips so that they lie on single transverse planes. May immobilize and support ankles. Has patient flex elbows and abduct arms. Adjusts extremities of unequal length at the joint above the unequal part.

iii) Performer centers the cassette to a level a little above the upper border of the symphysis pubis, at the level of the soft tissue depression above the greater trochanter, or at the level of the iliac crests unless otherwise specified. Makes sure not to use visual points of muscle or fatty tissue and palpate for the crest of the bone.

iv) Directs central ray at right angles to the midpoint of the film or at a caudal angle if specified.

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f. Performer rehearses non-infant patient in relaxing and breathing in and holding or breathing out and holding, depending on orders. Plans to use the same phase of respiration for all films unless otherwise ordered. With infant plans to expose at a given phase of quiet respiration.

g. Performer avoids applying direct pressure to abdomen if there is any danger of intra-abdominal neoplasm.

h. Performer sets the focal-film distance if not already done as appropriate. Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD (TFD) is obtained.

i. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. Adjusts the collimator so that a small unexposed border will appear around the edge of the film or collimates further so as to expose only the area of interest (and thus provide maximum protection and detail). Adjusts primary beam to minimum size needed to cover the area(s) of interest.

j. Performer adds lead shielding to areas that will be in the primary path of the beam but are not included in the areas of interest, especially gonads. Provides pa-

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tient and everyone who will remain in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

k. When everything is ready for the exposure, performer reminds non-infant patient of the cooperation and breath control to be used for exposure. Encourages patient to relax. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

l. Performer returns to control room:

   i) Makes sure controls are properly set, and that patient is still in position.
   ii) Calls or uses intercom to tell patient to carry out breathing instructions as rehearsed. Has patient breathe out and hold for suspended exhalation, or breathe in and hold for suspended inhalation or awaits appropriate quiet phase for infant.
   iii) When respiration has been suspended, performer waits one or two seconds to allow involuntary movement of viscera to subside and then makes exposure, or waits number of seconds judged necessary for patient to relax.
   iv) Performer initiates exposure by pressing hand trigger or exposure control button.
   v) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.
   vi) May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction may decide to report; anticipates need to repeat exposure.
   vii) With phototimer notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure.
   viii) After exposure is completed tells patient that he or she can breathe.
   ix) If the exposure is terminated by a circuit breaker, rechecks technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.
   x) After exposure removes cassette and removes markers for further use.

m. The performer arranges to have the scout film processed at once or decides to do personally.

   i) Attaches ID card for use with flasher if appropriate. May sign requisition.
   ii) If appropriate while the film is being processed and/or evaluated, performer has patient relax in examination room or holding area. Explains what will happen next. If appropriate, makes sure that patient will be attended while waiting.
   iii) Performer presents processed scout for review as described above.

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6. During physician's review of requisition, scout, prior films and examination of patient, performer notes physician's decisions and orders:

   a. If the physician indicates that procedure is to be terminated because there are contraindications, performer proceeds to termination steps as described below. If appropriate, arranges to have proper forms filled out and/or new requisition for other procedure made out and signed.
   b. If the physician decides that additional preparatory steps are needed, performer may arrange to have these carried out and/or performer arranges to reschedule patient.
   c. If the physician indicates that the scout film is not technically adequate, performer notes the physician's orders for change in technical factors, patient position, tube position, and/or centering of film.

      i) Notes whether the problem is due to performer's own negligence or lack of attention so that performer can avoid future "retakes."
      ii) If the problem reflects malfunctioning equipment, performer reports malfunction to appropriate staff member.
      iii) If the problem reflects the preference for density or contrast of the physician, performer notes for future use to avoid future "retakes."

   d. Notes physician's orders on sequence of examination. May discuss.

      i) Notes who will catheterize patient if not already done and

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whether own assistance is required.
      ii) Notes final orders on type and amount of contrast, use of ascending Lipiodal.
      iii) Notes whether contrast will be instilled with infusion equipment or by syringe. Notes whether filming will be required during instillation of contrast.
      iv) May check to be sure what gonadal protection can be provided without interfering with diagnostic purpose of study.
      v) Arranges to provide or change any equipment or supplies as ordered.

7. Performer carries out any additional preparation needed if not already done.

   a. If not already done, has patient void and assists as described earlier. May immobilize infant on radiolucent platform, comfort, provide bottle,or has this done.
   b. If appropriate has IV bottle or syringe prepared with sterile contrast solution, shaken and warmed as ordered. Hangs IV bottle on stand at appropriate height and places near examination table with tubing clamped.
   c. If performer is to assist with catheterization and/or administration of contrast medium, washes hands, observing sterile technique when appropriate.
   d. If appropriate, performer opens packet of sterile gloves for physician, observing sterile technique,so that wrapper, own hands, or other objects will not contaminate gloves.

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e. May assist as appropriate by handing materials and supplies asked for.

f. If performer is to assist with catheterization of patient, performer washes hands and follows sterile technique:

  i) May help assemble and hand materials, position patient, check balloon catheter.
  ii) May place collection basin and specimen bottle as ordered. May label, cover container.
  iii) If residual urine is measured, performer may record as ordered and write description as dictated.

g. If appropriate, performer may attach a container or bag to collect urine to a child patient's perineum and thighs in preparation for voiding.

h. Provides physician and anyone who will remain in room during voiding exposure with appropriate protective shielding. Explains purpose of shielding.

i. Performer may set up a rapid film changer and automatic equipment which triggers exposure on urine contact. May check that desired exposure time for voiding films is not longer than maximum time available with rapid changer unit.

j. Performer sets technical factors for first postinstillation overhead as described, adjusting for patient's position, physician's orders after viewing scout, and use of contrast material. Identifies first cassette as appropriate and places in bucky or under platform, adjusting centering as ordered or appropriate.

k. If appropriate, performer informs physician when patient and materials are ready for introduction of contrast solution. Makes any changes as ordered.

8. Performer stands by while physician infuses patient's bladder with the contrast solution using IV apparatus and urethral catheter or injects through catheter using syringe.

  a. With infusion technique performer may clamp and tape catheter to patient's thigh when ordered.
  b. May record amount of solution instilled if so ordered.

9. If performer is to make overhead films during instillation of contrast material, performer notes positions and centering ordered. Performer proceeds as described above or below in step 13 depending on the positions ordered.

  a. Performer may apply marker to cassette(s) indicating the amount of contrast instilled at that point in time.
  b. With infusion technique, performer may check that catheter has not become dislodged and that the fluid is dripping at an even rate. If there are any problems, performer clamps tube and notifies physician at once.
  c. If so ordered, lowers head end of table and makes sure that patient is securely held.
  d. When positioning patient performer makes sure that clamp of catheter is not lying over a part to be exposed or that patient is not lying on the clamp.
  e. While performer has radiograph(s) processed, makes sure that patient is attended.
  f. Submits processed radiographs to physician and carries out

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additional orders as appropriate. g. If a later film for detection of delayed reflux is ordered, performer notes appropriate time elapse and keeps track of time. Carries out delayed filming as appropriate as described earlier or below in step 13, depending on position ordered. 10. Performer stands by to assist physician or patient while infusion or injection of contrast proceeds. Performer remains alert for any symptom of severe pain or adverse reaction. As soon as performer judges that reaction may be severe, notifies radiologist or attending physician at once. 11. When the physician informs performer that the instillation is completed, performer notes orders for immediate overhead pre-voiding radiographs. Notes whether standard views and positions are ordered and/or special views and positions. a. Notes orders for recumbent or sitting positions. Notes side of interest and areas to be included, any orders for rotation of body, angulation of table or central ray. b. May discuss any special precautions needed in patient positioning to avoid injuring patient. May plan lateral decubitus position for patients unable to sit for lateral positioning. c. Performer resets technical factors as appropriate for each projection to account for use of contrast and patient position. d. May have physician fill out and/or sign requisition sheet. e. Plans to process each radiograph in series as soon as exposed and present to radiologist or physician for review (to avoid unneces-	sary radiography and to permit physician to revise orders). f. Performer continues to remain alert for any symptom of emergency or adverse reaction. As soon as performer judges that reaction may be severe, ceases exposure and notifies physician at once. g. Performer explains to patient what overhead radiography will be done and quickly prepares for filming. 12. Performer prepares patient for the final position ordered for the first (or next) exposure. Makes sure that correct side is being positioned when appropriate. a. May explain or demonstrate to patient what is required. May obtain help in positioning. b. Performer is careful to turn patient towards the catheter tubing so as not to dislodge it. c. Makes sure that the clamp is not lying over a part to be exposed or that patient is not lying on the clamp. d. Performer centers part and keeps the long axis of the part parallel to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part. With upright holder, adjusts height of holder to part and centers part to film. e. Performer repeats appropriate steps including identification of cassette, use of R-L markers, selection and setting of technique. 13. Performer positions as follows or as described earlier, depending on orders:

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a. For an AP supine projection of bladder and proximal part of urethra, performer positions patient in supine position as described, with legs extended so that anterior pelvic bones are tilted downward.

   i) Centers film a little above the upper border of the symphysis pubis.
   ii) Directs central ray at 5° caudad to midpoint of film, or 15° to 20° caudad with patient who has loss of normal lumbar curve.

b. For an AP projection (posterior view) of ureters, performer positions as in a, above, but lowers head end of table 15° to 20°. Directs central ray vertically to center of film.

c. For an axial view of posterior surface of bladder and lower end of ureters, performer has patient sit on side or end of table so that posterior surface of each knee is in contact with edge of table.

   i) Centers median sagittal plane of body to midline of table so that transverse axis of film coincides as nearly as possible to midaxillary plane of the body.
   ii) Centers film to median sagittal plane of pelvis.
   iii) May support feet with bench or stool. Has patient abduct thighs and lean directly forward until symphysis pubis is in close contact with table. May assist obese patient to achieve as close to a 45° angle of vertical axis of pelvis as possible. Has patient grasp ankles to maintain position.

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   iv) Directs central ray at right angles to film, centered to the lumbosacral region at the level of the greater trochanters. If flexion is restricted, directs central ray anteriorly at right angles to the coronal plane of the symphysis pubis.

d. For AP oblique projections (posterior oblique views) of the bladder and adjacent organs, performer notes the side of interest and whether bilateral views are ordered.

   i) Performer starts with patient in supine position.
   ii) Rotates supine patient 35° to 60° and supports the elevated (opposite) side. Places arms in comfortable position with shoulders in a single transverse plane.
   iii) Centers the pubic arch on the side of interest to midline and cassette to the level of the upper border of the symphysis pubis.
   iv) Has patient extend and abduct upper thigh. Directs central ray at right angles to midpoint of film or at 10° caudad or as ordered.
   v) With male patient extends the penis along the soft tissues of the medial side of the thigh on the side of interest.

e. For lateral view(s) of bladder, performer notes whether posterior or anterior bladder wall is the area of interest.

   i) Places recumbent patient in supine position for view of posterior wall and in prone position for view of anterior wall.

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- ii) For seated lateral view has patient assume a seated erect position on table as for voiding. Supports child. Adjusts body in true lateral position.
- iii) Uses vertical bucky or cassette holder centered to the coronal plane at the pubic arch, centered to the level of the bladder a little above the upper border of the symphysis pubis.
- iv) Directs central ray horizontally across table at right angles to midpoint of film.
- v) Maintains erect patient in position long enough for fluid levels to be accurately demonstrated.
- vi) Reverses position of central ray and cassette for opposite side lateral view.

f. For a lateral decubitus projection of the bladder, performer uses a horizontal bucky or cassette holder with patient lying on table.

- i) Has patient lie on side of interest with opposite side supported.
- ii) Centers cassette to the level of the symphysis pubis.
- iii) Has patient flex knees comfortably. Places supports under and between knees and ankles. Has patient flex elbows, place lower hand under head, and has patient grasp side of table with opposite hand. Elevates the torso. Supports and immobilizes infant.
- iv) Maintains patient in position long enough for fluid levels to be accurately demonstrated.
- v) Directs central ray vertically at right angles to midpoint of film.

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g. For a PA prone projection of bladder and upper part of urethra, performer has patient lie in prone PA position on table, with median sagittal plane centered to midline.

- i) Has patient flex elbows, place arms in a comfortable position. Supports ankles. Rests patient's head on cheek or chin. May have patient rest hands beneath chest. May support head and upper chest.
- ii) Centers cassette to a little above the level of the upper border of the symphysis pubis.
- iii) Directs central ray at 10° to 15° cephalad to enter about 1 inch distal to the tip of the coccyx and exit a little above the upper border of the symphysis pubis.
- iv) To project the shadow of the prostate above that of the pubis, performer directs central ray at 20° to 25° cephalad directed as in (iii), above.

14. Performer carries out post-instillation, pre-voiding cystography as ordered.

a. After positioning, performer again checks for ability of patient to relax, and repeats appropriate breathing instructions. With infant, calms and awaits appropriate phase. Repeats appropriate collimation. Provides shielding and makes exposure as described above.

- i) For small fields performer attaches an auxiliary extension cone to collimator to further reduce the primary beam.

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- ii) Repeats orders for breath control and relaxation for the same phase of respiration. If different phase is ordered from that planned for series, marks cassette accordingly.
- iii) Performer makes exposure as described above. Arranges to have each cystogram processed as soon as exposed.
- iv) While films are being processed, performer makes sure that patient is comfortable and, if necessary, attended by physician or staff member. Refrains from commenting on the films or providing any interpretation to patient.
- v) Places the films on view boxes as processed, in order, as they are taken. May hang scout and prior films. Informs physician as each processed film is ready for viewing.

b. Performer notes instructions after each film is reviewed. As appropriate, makes changes in timing, technical factors, patient positioning, projections, central ray and table angulation.

c. When told that pre-voiding cystography is completed, performer discusses sequence of procedure for voiding cystourethrography with physician (if ordered) or termination steps. Notes orders on protection, areas of interest, and intervals for filming.

15. If not already done, performer sets up equipment for voiding cystourethrography:

a. If automatic equipment is to be used with infant (triggered on contact with urine), performer sets up for radiography, and tilts table towards foot end so that

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urine will flow towards perineal electrode.

b. If rapid changer will be used, performer makes sure that planned exposure time does not exceed available capacity of unit. Sets equipment for non-automatic, intermittant exposure so that delays in filming can be adjusted to patient's voiding pattern. May set up for quarter format spot films if rapid changer will not be used.

c. Makes sure that physician and self have protective shielding.

d. When so ordered, if not already done, places patient on appropriate sitting apparatus for voiding and arranges receptacle. If male patient will void while standing, provides urinal.

e. Identifies, and places cassette(s) as appropriate; and places in rapid changer or bucky as appropriate.

f. May discuss signals with physician for exposing individual films during voiding.

16. When preparations are completed, performer stands by to assist physician with removal of catheter (if appropriate) and encouragement of patient to void.

a. Performer positions patient as ordered.

b. Performer may assist with encouragement of voiding of pediatric patients as indicated by physician.

17. On orders from physician or as predetermined, performer takes voiding cystourethrograms in positions described earlier as ordered, when indicated. May reposition patient, operate film changer as appropriate. Arranges for processing of films.

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Records amount of urine obtained if so ordered.

18. As soon as voiding is completed, performer takes post-voiding radiograph(s) in position(s) ordered as described above, has processed, presents for review,and awaits further orders as described above.

    a. Performer may repeat any procedures as appropriate such as for multiple fillings and voidings of bladder.
    b. May assist patient to complete voiding. Assists patient to descend from table and walk to toilet, or provides bedpan.
    If appropriate, moves x-ray tube and any protruding film holder away from patient before patient rises. May decide to assist patient from table. Makes sure patient is reminded of any footrest in stepping off table.
    c. For delayed films, performer may arrange to have patient taken to appropriate holding area. Keeps track of the time elapsed. If appropriate, makes sure that patient is in the care of a staff person who will transport to appropriate location and return patient at appropriate time. Takes delayed films as appropriate as described above.
    d. Notes any orders for delayed films of more than several hours and for termination of procedure. May have physician fill out and/or sign requisition sheet.

19. When performer is told by physician that the examination has been completed, performer carries out termination steps for the examination:

    a. Performer may have patient cleansed. May decide to assist patient

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from table. Makes sure patient is reminded of any footrest in stepping off table. Makes sure that none of the equipment is projecting over the patient before allowing patient to rise from stool or table, and assists patient.
    b. Performer may have patient transported to next assigned location, or decides to do personally, as appropriate. If appropriate, makes sure that patient is in the care of a staff person who will transport to appropriate next location or, if out-patient, will arrange to discharge or send patient home with escort as appropriate.
    c. Performer may have room and equipment cleaned; has urine removed with disinfectant; may decide to do personally.
    Disposes of urine left in basins or receptacles and discards disposable equipment following sanitary procedures. May have room aired or deodorized. Has any other appropriate clean up procedures followed to avoid infection or contamination, or decides to do personally, depending on institutional procedures.
    d. May check that any specimen has been prepared for laboratory, is properly identified, or decides to do personally. May present lab order forms to physician for signature.
    e. Performer records the examination according to institutional procedures. May include date, room, examination type, the overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each overhead view including retakes; may enter the estimated radiation dose to which patient

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was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet. f. May present requisition form to physician for comments and signature. g. Performer may decide to jacket radiographs, requisition sheets, and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. h. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

TASK DESCRIPTION SHEET

Task Code No. 463

This is page 1 of 13 for this task.

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;x-ray equipment checked,cleaned,set up;accessories assembled for use;pt.,cassette tunnels or holders,x-ray tubes positioned;pt. measured;cassettes identified and placed;technique selected and set;scout film,post-instillation urographic exposures made under sterile technique;processing and viewing arranged;urography continued as ordered;examination recorded;urograms placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Patient's x-ray requisition sheet,ID card,ID bracelet,medical-technical history,prior radiographs; phone;view boxes;pen;portable or permanent operating room x-ray unit(s);control panels;electrical outlets; rapid cassette changer;x-ray tube(s);bucky or cassette tunnel;vertical cassette holder;collimator;ID, R-L markers;procedure tray with iodine based contrast solution,materials for catheterization,renal function study;emergency cart;extension cones;calipers;shielding;soap;disinfectant solutions;cleaning cloths;immobilization devices;technique,standard view,tube rating and rad exposure charts;intercom

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Non-pediatric pt.;nurse;supervisor;anesthesiologist; urologist;co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking retrograde pyelograms and ureterograms of non-pediatric pt. by reviewing request;arranging for transport,cleaning equipment;preparing for serial or stereoscopic radiography,if ordered;measuring part; positioning equipment and cassette holders and/or patient;selecting and setting exposure factors for scout and contrast films;collimating;providing shielding;observing sterile procedures;instructing patient in breath control;making exposures;arranging for processing and viewing by urologist;continuing as ordered;recording examination.

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Performer receives or obtains the x-ray requisition form, patient identification card, and any appropriate medical-technical history for a non-pediatric patient scheduled for retrograde pyelography or urography (radiographic contrast study of pelvocalyceal system of kidneys and ureters after ureteral catheterization) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Performer may also receive prior scouts, urograms, and/or record of exposure technique(s) used and/or any changes necessary.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for and the purpose. Notes the urologic procedure room assigned and its location; checks the time for the scheduled procedure, and, if (or as) appropriate, the time to report for preliminary preparations and/or any request for a

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

TASK DESCRIPTION SHEET (continued)

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scout film prior to catheterization.

b. Notes name of attending urologist and/or charge nurse or supervisor.

c. Performer reads patient's name, identification number, sex, age, weight, and height. Notes any special information or note on known pathology that could affect patient positioning, technique, or handling. Notes any prior history of allergic reaction to contrast or allergies.

d. Notes whether both ureters are to be catheterized and/or side of interest; notes whether a kidney function study is ordered. Notes whether patient is to be anesthetized, and whether before or after performer arrives for procedure.

e. Notes requirements for special equipment or techniques such as need for a second portable x-ray machine, use of serial films using rapid changer(s), use of stereoscopic technique.

f. Performer checks whether patient is suffering from a collateral condition requiring special handling such as heart disease, communicable or infectious condition, infirmity, incoherence. Notes shielding appropriate for examination based on sex, age and positions ordered.

g. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

   i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done elsewhere in recent past, whether history of extensive radiography should be reported.

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   ii) Checks whether any special orders on exposure factors are in keeping with the usual rad exposure involved for the examination.

   iii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.

h. If the performer determines that the request is not properly authorized, is incomplete, that there may be contraindications to going ahead with the procedure, or that sufficient information is lacking for performer to carry out radiography, notifies supervisor, urologist in charge, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate and proceeds after obtaining needed information, signature, or orders.

i. Performer may have request that prior radiographs be made available. If so, performer may arrange to have prior films delivered to procedure room or may arrange to transport personally.

2. Performer determines what prior preparations will be needed, such as provision of mobile x-ray equipment and accessories, proper dress, consultation with urology procedure room staff:

   a. Performer determines whether assigned procedure room has one or more x-ray units already available, or whether one or two units must be transported to the room. Plans to check and clean x-ray equipment in appropriate storage area(s).

TASK DESCRIPTION SHEET (continued)

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Checks whether a Potter-Bucky diaphragm or grid-front cassettes and a cassette tunnel will be used.

b. Performer notes whether film processing equipment is available adjacent to procedure room. If films must be processed in radiology department, performer makes sure that someone is assigned to pick up, process, and return radiographs to procedure room as they are ready.

c. Performer checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.

d. Performer may contact urology staff to receive more detailed orders, information, or to check on safety, timing or availability of equipment.

e. If appropriate, performer decides to prepare, transport and set up any portable radiography equipment in the assigned procedure room, or has this done.

3. Performer goes to appropriate procedure room to prepare equipment and materials for the procedure:

a. Performer may report to the charge nurse or supervisor (with portable equipment if transported). Indicates name of patient and determines exact location for setting up equipment. Performer asks about specific precautions in dealing with patient. May record. Asks about any special equipment which must remain in place and be taken account of in setting up radiography unit. Washes hands before and after assembling materials following sanitary procedures.

b. Performer makes sure that unit(s) to be used has an adequate output for the required radiography and is hazard-proof and, if appropriate,

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certified for use near general anesthesia equipment. If procedure room is not insulated for use with non-grounded equipment, checks that any mobile unit is equipped with rubber casters. Checks for proper filter in x-ray beam, fractional focal spot size,whether light beam in collimator is hazard-proof or not to be used. Checks whether use of bucky is compatible with safety requirements. If unit is battery operated checks that batteries are charged.

c. If not already done, performer prepares damp cloths with appropriate antiseptic and/or disinfectant solutions. Makes sure unit(s) is disconnected, and wipes equipment thoroughly to remove dirt,dust and lint. If not already done, performer assembles tube stand of unit and FFD measuring device as appropriate to equipment.

d. Makes sure that line cord with grounding terminal, and remote control exposure cord are present and properly attached to unit.

e. Performer positions portable apparatus being careful not to disturb any equipment or electrical cords plugged in. Does not run over cords; lifts cords when possible or asks for assistance.

f. Performer may check out equipment for use in procedure room before setting up for use at procedure table. Uses anticipated exposure technique.

  i) May make sure that line power switch(es) are off. Checks for proper grounding as (or if) appropriate.

  ii) May connect all low voltage cables to control panels if not already done.

  iii) May connect power cables to line power outlets after check-

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ing that voltage is appropriate. Tests equipment by selecting (for each unit) mA, kVp and time as appropriate and turning on main switch. After machines are warmed up, checks for kV readings. If appropriate, adjusts line voltage compensators.

iv) When performer determines that (each) machine is operating, turns off line power switches (if appropriate).

g. Once the machine(s) has been checked performer sets up the x-ray unit(s):

i) Places machine(s) so that x-ray tube can be directed vertically from above and/or if appropriate, another tube can be directed across the table. Checks that tube(s) can be adjusted to required distances (focal-object distance, FOD, and focal-film distance, FFD).

ii) Makes sure that performer will be able to stand minimal required distance away from x-ray beam(s) during exposure behind shielding.

iii) Locks and/or uses brakes to immobilize portable equipment in place and moves overhead tube out of way until needed.

h. Performer may receive a clean hospital gown, cotton "boots," cap and mask from the charge nurse or operating room supervisor. Performer dons these before entering sterile area. Washes hands as appropriate. Carries out appropriate steps to maintain the integrity of the sterile area of the procedure room and does not touch patient, drapes, urologist, nurses, instrument tables or "back table" with nonsterile object.

i. Performer may report to anesthesia area of room to discuss appropriate timing of scout film and/or presence

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of any explosive gases.

j. Performer may discuss placement of cassette tunnels or grids with appropriate staff member (if not part of procedure table) so that they can be placed on table while prior preparations are being made. May give cassette tunnels to appropriate staff member and check that they are placed so that openings face the free end of the table while being part of sterile field, and that any vertical holder to be used is positioned properly.

k. Checks that proper accessories are available for radiography including leaded rubber shielding and aprons to be used by performer, the patient, urologist, and/or anyone who will remain in the room during exposure. Checks that appropriate immobilization devices are present, that there is a mattress, pads, pillows and/or blankets for comfort of patient. May attach leg extensions, foot-board to table. Makes sure that right (R) and left (L) markers are available for use, identification cards, or leaded numerals or markers.

l. Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room including cassettes for rapid film changer if appropriate. Selects appropriate speed and type of film, grid, and cassette combination depending on the techniques to be used and standard institutional practices. Selects size based on patient's size and area of interest. If adequate supply is not in room, arranges to obtain or decides to obtain personally.

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m. Performer identifies cassettes using equipment provided by institution:

  i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.

  ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may type or write out ID information on card if not received with requisition.

  iii) Checks identification against requisition sheet.

n. If a rapid cassette changer will be used, performer sets rate that is standard for procedure or awaits urologist's orders:

  i) May cycle unit to check operation before loading. If so, makes sure that anode is not rotating.

  ii) Performer loads rapid changer with cassettes as appropriate. Plugs synchronization cable from unit into appropriate receptacle on the x-ray control panel.

o. Performer reviews the technique chart for the machine(s) to be used and takes note of any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

p. Performer checks that x-ray equipment is ready for use. Goes to control panel and checks that indicator light shows that machine(s) is "warmed up," or turns on main switch as appropriate to equipment and allows time for the machine to "warm up." If appropriate, performer may set radiography mode selector and set collimator control for manual operation. Makes sure that all circuits have been stabilized.

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q. Performer may note whether a preliminary scout film has already been made of the patient (done earlier and/or by another radiologic technologist).

  i) If a scout film has already been made and viewed by urologist,performer notes the technique used or ordered and plans technical factors,adjusting as appropriate.

  ii) If a scout film has been made but not approved, performer places processed scout film and any prior films with patient's chart or places on view box for review.

  iii) If a scout film has not been made and is required before patient is catheterized, performer proceeds as described below. Otherwise awaits orders from urologist.

4. If performer will be able to measure patient before he or she is anesthetized and/or catheterized, performer greets patient in appropriate location. Checks patient's identity. Introduces self and explains own role in the procedure. Performer attempts to reassure patient and develop confidence. Performer explains the need to measure the patient for radiography and to instruct the patient in breathing.

TASK DESCRIPTION SHEET (continued)

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a. If patient will not be under general anesthesia, and if not already done, performer explains to patient what will be involved in the procedure:

   i) Describes catheterization (if not yet done), instillation of contrast, and what performer will be doing.
   ii) May encourage patient to inform or report to urologist any discomfort or pain in the back or loins when the filling is underway as a guide for urologist to judge proper amount of contrast to use.
   iii) Explains the importance of patient's being able to relax. Indicates what types of positions the patient will be asked to assume. Describes the probable breathing control.
   iv) Performer answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Remains aware that patient may be frightened and/or in pain. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

b. Performer encourages patient to relax. Rehearses patient in suspending respiration after exhalation and relaxing. Performer may check patient's relaxation by keeping hand on patient's back to detect tenseness. Performer may judge time interval needed after cessation of respiration for patient to relax, and plans to adjust exposure timing accordingly.

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c. Unless measurements have already been made, performer uses centimeter calipers to measure the thickness of the abdomen in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film.

   i) Performer evaluates the patient's bodily habitus to estimate the position of the kidneys.
   ii) Notes whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points are easy to find.
   iii) Records measurements for use in determining exposure factors.

d. If procedure has begun, performer estimates patient's measurements based on charted information on weight, height, body type, age and sex. May consult urologist or other staff member.

e. Performer informs attending urologist when ready. If not already done, brings any processed scout film and any prior films to urologist. Displays radiographs on view boxes.

f. If appropriate, performer arranges to take scout of abdomen as described below. Otherwise awaits urologist's orders for scout. Checks the first position ordered.

   i) If a scout film has already been processed, performer notes urologist's orders for changes in technical factors, patient position and/or centering.
   ii) If patient is to be placed under general anesthesia, performer coordinates timing of procedure

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and filming with anesthesiologist and urologist.

5. After patient is positioned on table, performer checks positioning to be sure patient is properly centered for first (or next) radiograph.

6. As sterile area is prepared, patient is catheterized, and any injection for renal function test is made, performer sets technical factors for the first (or next) overhead (usually supine AP of abdomen to demonstrate ureteral catheter placement):

   a. Consults the technique chart posted for the machine. Locates the information needed for the body part and projection involved according to the centimeter thickness of the part and position as measured, and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed and use of other accessories (such as screens, grids, bucky, etc.).
   b. Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.
   c. Once the standard kVp, mA and time have been determined, makes any conversions necessary to account for extreme fat or muscularity, the preference of the urologist involved and any other conversion needed such as posted changes. Performer looks up numerical conversion factors and calculates or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.
   d. Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs.
   e. Performer sets the exposure factors as selected:

      i) Sets controls for radiography mode.
      ii) If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.
      iii) For conventional exposure control, performer sets the milliamperage selected for the correct focal spot size. Sets the selected exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.
      iv) For automatic phototimed exposure control, performer sets the category corresponding to the type of study and use of screens, bucky, etc., and, if appropriate, focal spot size. Sets a control corresponding to the selected field size (as listed on technique chart for phototiming). May set a kVp range button, if called for with equipment, corresponding to the appropriate kV range for the examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to

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terminate exposure before phototimed exposure is made.

v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustments of table, tube height, position, and collimator.

f. Performer obtains the appropriate size loaded cassette for the first (or next) projection. Attaches identification information to the cassette or table top:

i) Places right or left marker on film holder or table-top as appropriate, or depresses appropriate R or L button for automatic marking.

ii) If patient's identification information is in the form of lead numerals or marker, performer places on appropriate corner or cassette.

iii) If patient identification information is to be entered by use of flasher, sets flash card aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.

iv) Performer may place patient's card into card tray for equipment using automatic film marking device.

v) If patient has already been draped, performer has nurse or someone who is part of sterile team lift the drape to expose opening of bucky or cassette tunnel and replace drape after cassette is placed.

vi) If cassette is to be used with bucky, performer may manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps

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are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

vii) If a cassette tunnel is being used, performer places cassette in tunnel.

g. If not already done, performer provides self, urologist and everyone who will be in room during radiography with protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

7. For a supine AP projection (posterior view) of abdomen, performer has patient placed in supine position, with the median sagittal plane of the body centered to the midline of the table or film holder.

a. Has patient's shoulders and knees elevated so that patient's back is in contact with table, or elevates thighs. Supports. Has shoulders and hips adjusted so that they lie on single transverse planes. May immobilize ankles. Has patient flex elbows and abduct arms.

b. Smooths out any folds in sheets or covering under patient or has this done.

c. Has patient centered to the bucky or film at the level of the iliac crests unless otherwise specified. Makes sure not to use visual points of muscle or fatty tissue and palpates for the crest of the bone.

d. Directs central ray at right angles to the midpoint of the film.

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e. Checks and adjusts the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD is obtained.

f. Performer collimates so that a small unexposed border will appear around the edge of the film, or collimates further so as to expose only the area of interest (and thus provide maximum protection and detail). Performer may attach an auxilliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the part(s) of interest. (Does not use light beam in procedure room unless it has been certified as safe for use in presence of explosive gases.)

g. If not already done, performer adds lead shielding to areas that will be in the primary path of the beam but are not included in the areas of interest, or has this done.

8. When everything is ready for the exposure performer checks with urologist and/or anesthesiologist on timing. Has all persons not needed at table during exposure leave room.

a. If patient is to be radiographed without or before being anesthetized, performer rehearses patient in relaxing and breathing in and holding, or breathing out and holding, depending on orders. Plans to use the same phase of respiration for all films unless otherwise ordered. Encourages patient to relax. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

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b. If patient is under anesthesia performer arranges to make exposure on signal from anesthesiologist that respiratory arrest has been induced. Plans to act on anesthesiologist's signal.

c. Performer returns to control room for exposure or walks to safe distance from tube with exposure control cord:

i) Makes sure controls are properly set, and that patient is still in position.

ii) Calls or uses intercom to tell conscious patient to carry out breathing instructions as rehearsed. Has patient breathe out and hold for suspended exhalation; or awaits anesthesiologist's signal.

iii) When respiration has been suspended, performer waits one or two seconds to allow involuntary movement of viscera to subside and then makes exposure, or waits number of seconds judged necessary for patient to relax.

v) Performer initiates exposure by pressing hand trigger or exposure control button.

vi) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

vii) May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction may decide to report; anticipates need to repeat exposure.

viii) With phototimer notes whether backup timer has been involved

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in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure.

d. After exposure is completed tells patient that he or she can breathe or indicates to anesthesiologist that respiration can be resumed.
e. If the exposure is terminated by a circuit breaker, rechecks technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.
f. After exposure performer returns to patient. If patient has been draped, has surgical drape raised to expose cassette holder. Removes cassette.
g. Removes any markers for further use.
h. Performer arranges to have the scout film processed at once:

   i) If there is no processing equipment adjacent to procedure room, performer gives cassette to co-worker for processing.
   ii) If there is a darkroom with processing equipment next to operating room, performer arranges to have the film processed at once or decides to do personally.
   iii) Attaches ID card for use with flasher if appropriate. May sign requisition.

9. When the scout film has been processed and returned, performer places on view box in appropriate nonsterile area of room. May also hang prior films. Informs urologist that radiograph is ready for viewing.

   a. If urologist indicates that the scout film is not technically adequate, performer notes urologist's orders for change in technical factors, patient position, tube position, and/or centering of film.

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      i) Notes whether there is problem due to performer's own negligence or lack of attention so that performer can avoid future "retakes."
      ii) If problem reflects malfunctioning equipment, performer reports malfunction to appropriate staff member.
      iii) If problem reflects the preference for density or contrast of the urologist, performer notes for future use to avoid future "retakes."

   b. If appropriate, performer repeats scout film when or if catheter(s) are repositioned.
   c. Performer notes urologist's orders for sequence and timing of procedures:

      i) Notes sequence of patient positions ordered.
      ii) Notes any orders for use of rapid cassette changer such as rate of speed. Sets rate and checks that planned exposure time does not exceed available capacity of unit.
      iii) Notes any orders for stereoscopic views.
      iv) Checks whether bilateral views are ordered, side and area of interest, centering.
      v) Checks what gonadal protection can be provided without interfering with diagnostic purpose of study.
      vi) May arrange signals with urologist for making exposures.

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10. During filling of renal pelves and calyces, performer positions cassette for next exposure unless rapid changer will be used and has already been loaded:

    a. Performer sets technical factors for first post-instillation overhead as described, adjusting for patient's position, urologist's orders after viewing scout, and use of contrast material.
    b. Inserts properly identified cassette into bucky or cassette tunnel under lifted drape, as described above.

11. Performer positions as follows (or as described below for later steps) depending on the position(s) ordered:

    a. For a supine AP projection (posterior view) of kidneys, performer positions patient as for scout film, centering to the level of the iliac crests or estimated location of kidney on side of interest.

        i) Performer may direct central ray at 5° cephalad to the midpoint of film.
        ii) Performer may lower head end of table 15° to 20° and direct central ray at right angles to midpoint of film.

    b. For anterior oblique projections (posterior oblique views) of kidneys, performer starts with patient in supine position.

        i) For a left AP oblique projection (left posterior oblique view) performer rotates supine patient 40° to 45° and supports the elevated (right) side.

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Places arms in comfortable position with shoulders in a single transverse plane. Centers cassette to the upper lumbar vertebrae adjusted for patient's body type, and somewhat higher than for right view, at about the level of the xiphoid process. Directs central ray at right angles to midpoint of film.

        ii) For a right AP oblique projection performer positions patient similarly to (i), above, but on opposite side. Centers cassette somewhat lower than for left view. Directs central ray at right angles to midpoint of film.

    c. For a lateral view of kidney, performer notes the side of interest and has patient assume lateral recumbent position on that side.

        i) Has patient flex knees comfortably, and centers midaxillary line to midline. Places supports under and between knees and ankles. Has patient flex elbows, place lower hand under head, and has patient grasp side of table with opposite hand. Supports thorax.
        ii) Centers cassette at the level of the upper lumbar vertebrae adjusted for patient's body type and somewhat higher for view of right kidney, at about the level of the xiphoid process.
        iii) Directs central ray at right angles to midpoint of film.
        iv) If so ordered, may have patient lie in supine position with vertical bucky or cas-

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sette holder centered to the level of the kidney on the side of interest. Directs central ray horizontally across table at right angles to midpoint of film.

v) Reverses position of central ray and cassette for opposite side lateral view.

d. May position two x-ray tubes for biplane, simultaneous exposures of AP and lateral projections.

e. For stereography, unless equipment is automatic, centers and adjusts the central ray at the angle appropriate for a single plane study. For first exposure moves centering point the correct distance in the appropriate direction (such as laterally or posteriorly); then increases or decreases the angle as appropriate. For the second exposure, removes the first cassette and replaces with a second cassette and, starting from single plane angulation, shifts centering in the opposite direction and for the same distance; changes the angulation in the opposite direction (increases or decreases). Reminds patient or urologist that position is to be maintained for second exposure.

f. For automatic stereo filming, puts the two x-ray tubes into position for frontal or lateral shift at desired angle; places cassettes into position; sets controls for automatic sequential exposure.

g. Repeats shielding and collimation steps as appropriate as described above. Attaches an auxiliary extension cone to collimator to further reduce the primary beam. Makes sure no one is in line with central beam during horizontal beam exposure.

h. Performer again rehearses patient (if conscious) in relaxing and suspending exhalation (and/or suspending inhalation if so ordered) while remaining relaxed.

i. Performer makes exposure on signal from urologist or anesthesiologist as described earlier, waiting a few seconds after suspension of respiration. Operates rapid changer as appropriate.

12. Performer has pyelograms processed at once for viewing, as described above. Continues with radiography at intervals determined by urologist following steps as described above or below until told by urologist that radiography has been completed.

13. For ureterograms performer may, if ordered, elevate the head end of table 35° to 40°. Increases kilovoltage as appropriate to allow for increased thickness of abdomen in this position.

a. For "shift technique," performer makes a second exposure on a cassette already exposed, but shifts tube laterally about 2 or 3 inches away from the side of interest. Reduces exposure time as appropriate.

b. Performer positions as described above and centers as ordered. Repeats steps for set-up.

c. Makes exposure(s) on signal from urologist and arranges for processing and review as described.

14. When told that the radiography has been completed, performer carries out termination steps:

a. Makes sure that main switch is off for each mobile unit.

b. Disconnects power cables and grounding cords if appropriate for mobile units.

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List Elements Fully	List Elements Fully
c. Performer may clean the equipment after use. Washes hands as appropriate. Removes sterile garments and shielding. d. Performer records the radiography according to institutional procedures. May include date, procedure room, name of procedure, the views taken, the technical factors used, and film sizes; may record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment. Signs requisition sheet. e. May present requisition sheet to urologist for comments, orders, and signature. f. Performer may arrange to jacket films, requisition sheets, and related materials and/or have information recorded in log book, depending on institutional procedures. g. May report to supervisor or nurse in charge of room that radiography is completed. h. May decide to reassemble equipment and transport back to radiology department or has this done. i. May indicate to appropriate staff person when the performer is ready to proceed with next radiographic procedure.	

TASK DESCRIPTION SHEET

Task Code No. 464

This is page 1 of 8 for this task.

1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed; films identified; technical factors selected and set for fluoroscopy, spot filming; radiologist assisted with patient positioning, fluoroscopy, spot filming; spot films sent for processing, taken to radiologist; examination recorded; spot films placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Patient's x-ray requisition sheet, ID card, medical technical history, prior radiographs; view boxes; pen; x-ray generator, control panels, tilt-table; fluoroscopy unit, tube, image intensifier; grid; bucky, spot film device; roll film or cassettes; TV monitor; collimator; R-L, ID markers; procedure tray; emergency cart; leaded shielding, aprons, gloves; immobilization devices; technique, standard view, tube rating and rad exposure charts; phantom or test object

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any patient; radiologist; attending clinician; nurse; co-worker

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Providing technical assistance for an examination of any patient requiring fluoroscopic control and spot filming, by reviewing request; preparing equipment; setting factors for fluoroscopy, spot filming; identifying films; providing shielding; assisting with positioning of patient, tube, table; arranging for processing; recording examination.

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Performer receives or obtains the x-ray requisition form, patient identification card, and any appropriate medical-technical history for a patient scheduled for an examination requiring an instrument placement check under fluoroscopic control and not requiring overhead radiography (such as renal biopsy) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, and to check the completeness of the information provided:

   a. Performer checks the examination called for, the part of the body involved, and whether contrast medium will be introduced.
   b. Notes the time, the procedure room, and the radiologist in charge; notes the name of the attending clinician in charge if appropriate.
   c. Performer reads patient's name, identification number, sex and age. Notes any special information or note on known pathology that could affect

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

TASK DESCRIPTION SHEET (continued)

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patient positioning, technique, or handling of the patient. Notes whether the use of a grid or bucky will be involved, the type of shielding needed. Notes any special requests such as for spot films.

d. Performer checks whether patient is suffering from a collateral condition requiring special handling such as heart disease, communicable or infectious condition, infirmity, incoherence; whether patient has IV drip, oxygen supply, urinary cathether or similar device in place.

e. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done elsewhere in recent past, whether there is history of extensive radiography.

ii) Checks whether any special orders on exposure factors are in keeping with the usual rad exposure involved for the examination.

iii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.

f. If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly

List Elements Fully

assist, or if performer considers that there may be contraindications to going ahead with the procedure, performer brings this to attention of physician in charge. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

g. If referring physician has requested that prior radiographs already on file be presented, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead for examination:

a. Washes hands as appropriate.

b. Checks that procedure tray has been prepared for the study involved or decides to do personally. May check that emergency cart is present. May check that appropriate slides, labels and containers for any specimens ordered are prepared or decides to do personally.

c. Checks that proper accessories are available for procedure including leaded rubber shielding, aprons, and gloves to be used by performer, clinician, radiologist, the patient, and/or anyone who will remain in the room during exposure.

d. Performer checks that appropriate immobilization devices are present. Checks that mattress, pads, pillows and/or blankets are present for comfort of patient. Makes sure that right (R) and left (L) markers are available for use, and identification cards, or leaded numerals or markers.

TASK DESCRIPTION SHEET (continued)

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This is page 3 of 8 for this task.

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e. If examination may include spot filming using a camera (attached to image intensifier) and roll film, performer checks film supply indicator to make sure that there is sufficient film in the roll film cassette.

   i) If there is insufficient roll film in camera, performer arranges to have roll film cassette loaded, or decides to do personally.
   ii) When loaded roll film cassette is obtained, performer checks loading in subdued light. Checks that end of film is cut correctly and is properly threaded and attached to take-up spool so that film unwinds appropriately. Checks that film is properly engaged in sprockets. Locks into operating position. If appropriate, cuts off excess film at exit port and removes. Attaches film cassette to camera and locks into place. Replaces camera cover.
   iii) If there is an adequate film supply, checks that film is properly loaded.
   iv) Performer advances film to compensate for any exposure of film due to installation or check.
   v) Removes dark slide from camera lens.
   vi) If not already done, performer writes or types a card with patient's identification information for use with spot film device. Inserts in slot in spot film camera as appropriate.

f. If examination may include spot filming using a cassette/bucky spot film device, performer checks that there is an adequate supply of appropriate size cassettes in room.

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   i) If there is insufficient supply of cassettes, arranges to obtain or decides to obtain personally.
   ii) Performer prepares for identification of the spot film cassettes. Depending on institutional procedures, performer may prepare for use of flash card by checking that there is piece of lead on cassette surface; may write or type out ID information on card if not received with requisition. Sets flash card aside for later use with space created by piece of leaded rubber on appropriate edge of cassette(s). May place card into card tray for equipment using automatic film marking device.
   iii) Performer may use controls or manually pull out spot film bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position.
   iv) If R-L markers are to be used with spot filming, performer tapes into place on image intensifier screen or plans to tape to patient's body.

g. If a grid will be used with the image intensifier for fluoroscopy and/or spot filming, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

TASK DESCRIPTION SHEET (continued)

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h. Performer reviews technical exposure factors for fluoroscopy and spot filming based on standards set by the institution as appropriate for the examination involved:

  i) Locates information for the part of the body and positions involved. Takes note of the exposure factors to be used for fluoroscopy, spot filming. Considers preferences of the radiologist involved and the use or nonuse of contrast medium as appropriate.

  ii) Notes any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

  iii) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs.

i. Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.

j. In the control room performer makes sure that indicator light shows that x-ray genetator is "warmed up" and ready for use. Makes sure that all circuits have been stabilized. If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

k. As appropriate, performer sets x-ray generator mode selector(s) to fluoroscopic mode and for use of spot film camera or cassette device.

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l. Performer sets control on image intensifier for spot film camera or cassette device:

  i) For spot film camera, performer selects and sets the rate (frames per second) for the camera according to standards set for examination.

  ii) For cassette spot filming, performer may select and set a standard spot film program providing for format combinations such as single, half, or quarter combinations on a single cassette and related spot film sizes. Selects program appropriate for examination or awaits orders.

m. If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

n. If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

o. Performer selects and sets exposure factors for fluoroscopy:

  i) Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination.

  ii) If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved.

  iii) Sets fluoroscopic examination timer to maximum position.

TASK DESCRIPTION SHEET (continued)

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p. If appropriate, performer selects and sets exposure factors for spot filming:

   i) For conventional manual exposure control, performer selects and sets the appropriate spot film time for the examination.
   ii) For automatic, phototimed exposure control, performer selects a density exposure control appropriate for the examination.
   iii) Performer selects the appropriate mA for the examination and the focal spot size to be used.
   iv) Performer selects and sets kVp by combining settings on one major and one minor kVp selector as appropriate for the examination.

3. Performer sets up x-ray and fluoroscope tube(s), image intensifier, collimator and accessories, as appropriate, for check of equipment prior to examination:

   a. Makes sure that no one is in room.
   b. Places phantom or appropriate test object on radiography table where patient's area of interest will be centered for examination.
   c. Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.
   d. If not already done, moves image intensifier and any spot film device into position; centers (over or under) the area of interest.
   e. Performer adjusts distance between focal spot and image intensifier (focal spot to film distance, FFD). Makes sure that TOD is 15 inches

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or more for fluoroscopy. Operates controls or manually moves the x-ray tube(s) into place. Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD is obtained.
   f. Performer collimates fluoroscopy tube (and x-ray tube used for spot filming if different), depending on nature of the equipment and controls:

      i) Adjusts fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or sets shutter mode selector to automatic collimation.
      ii) Manually sets collimator for the spot film field size to be used, or selects and sets field size control to be used for automatic collimation with programmed spot film cassette exposure sequence.

   g. If appropriate, performer attaches or sets up footboard at end of tilt-table; may adjust or attach shoulder rest, hand grips.

4. If not already done, performer checks functioning of fluoroscopy equipment by entering remote control room or operating controls in examination room behind leaded screen:

   a. To check fluoroscopy mode, performer turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.

TASK DESCRIPTION SHEET (continued)

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i) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.
ii) Checks mA meter and notes whether appropriate reading is obtained.
iii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.
iv) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

b. To check spot film functioning, performer may move cassette or roll film into x-ray exposure field using appropriate controls:

i) Performer activates controls for spot film exposure. Notes whether cassette or roll film transport is operating appropriately. Notes whether exposure is terminated by phototimer or, if manual timer, in time set. If appropriate, releases spot film control after exposure.
ii) If equipment is operating appropriately, performer unloads cassette and reloads or advances roll film as appropriate. Moves bucky out of way until fluoroscopy is completed.

c. After equipment has been checked performer shuts and resets for selected exposure factors. If performer decides that any of the fluoroscopic equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

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5. When fluoroscopy equipment has been set up, performer may bring requisition sheet, patient's medical history, chart, and any prior films to radiologist or clinician in charge. Displays radiographs on view boxes.

a. If not already done, performer tells physician about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to physician's attention. Notes any special orders or change in procedure decided. Proceeds as ordered.
b. Performer may greet staff and patient in procedure room. Washes hands as appropriate. May tape R or L marker to patient if appropriate for use in spot filming.
c. Performer discusses sequence and timing for procedure with radiologist or clinician. May arrange signals for exposure, changing of spot film cassettes, operation of exposure controls. Discusses how patient will be assisted or held.
d. Performer arranges to provide any equipment or materials not already present or decides to do personally. Adjusts technical factors and program for fluoroscopy and spot filming as ordered.
e. Performer gives leaded gloves and apron to radiologist or clinician. If appropriate, places leaded curtain in place. Provides patient and anyone to remain in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

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6. Performer assists with preliminary adjustment of fluoroscopic factors:

   a. Performer may assist in positioning of patient; may operate tilt-table as ordered.
   b. On signal from radiologist, performer may dim room lights. Turns on TV power switch. May go to control room and operate fluoroscope and spot film controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders.
   c. If preliminary spot films are to be made and if spot film attachment uses cassettes, performer may unload as used, identify, and insert additional cassettes, as described above. Performer prepares to process spot films at once:

      i) With cassette spot films, removes any markers for further use. Attaches ID card for use with flasher if appropriate.
      ii) With spot film camera, performer advances the film so that all exposures made will be wound on the take-up spool in the roll film cassette. Uses device to cut film and create a light shield. Resets counter and removes film cassette.
      iii) Arranges to have spot films processed at once or decides to process personally.
      iv) When the spot films have been processed and returned, performer places on view boxes. May also hang prior films. Informs radiologist that radiograph(s) are ready.

   d. Performer notes any orders for changes in technical factors and adjusts as ordered.

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7. Performer assists during fluoroscopic examination as described above.

   a. Operates exposure controls as ordered or positions table, tube, or patient as ordered.
   b. If spot film attachment uses cassettes, performer may unload as used, identify, and insert additional cassettes, as described above, throughout procedure.
   c. Depending on institutional procedures, performer may keep radiologist or physician informed of cumulative exposure as shown on fluoroscope timer indicator.
   d. Performer may record location of lesion, assist with labeling of samples and/or record and identify any specimens taken as ordered when appropriate.
   e. Performer arranges to have spot films processed as they are taken or as ordered as described above.
   f. Performer brings the processed spot films directly to the radiologist or places on view boxes and informs radiologist or clinician that they are ready. May hang prior films.
   g. Changes technical factors as ordered and assists with any continued fluoroscopy and spot filming as described until radiologist or clinician indicates fluoroscopic examination is completed.

8. After the fluoroscopy is completed, performer carries out termination steps:

   a. Coordinates with staff who will care for patient. Removes any markers from patient's body.
   b. May have equipment cleaned; has any other appropriate clean up procedures followed to avoid infection

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or contamination, or decides to do personally, depending on institutional procedures. c. Performer records the examination according to institutional procedures. May include date, room, examination type, the technical factors used. Performer may record the number of spot films made including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage). May record fluoroscopic exposure time and rad dosage; may record any problem with equipment, any special care provided patient. May sign requisition sheet. d. May present requisition form to radiologist or clinician for comments and signature. e. Performer may decide to jacket spot films, requisition sheets, and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. f. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

TASK DESCRIPTION SHEET

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This is page 1 of 18 for this task.

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected and set for fluoroscopy,spot filming,overheads;scout taken; radiologist assisted with pneumoperitoneum,instillation,positioning,fluoroscopy,spot films,video;pelvic pneumograms,hysterosalpingograms taken as ordered,processed,presented;overheads repeated as ordered;pt. sent to recovery area or returned;examination recorded;radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, medical-technical history,prior radiographs,ultrasonograms;phone;view boxes;pen;x-ray generator,control panels,tube,bucky,table,collimator;ID,R-L,series markers;fluoroscopy unit,image intensifier,spot film device,TV monitor;cassettes;roll film;videotape device;procedure tray,materials for pneumoperitoneum, pelvic exam,instillation of iodine based contrast solution;phantom or test object;emergency cart;extension cones;stool;calipers;vertical cassette holder; shielding;heating device;hospital gown,gloves;immobilization devices;technique,standard view,tube rating and rad exposure charts;forms;intercom;wheelchair

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Non-pediatric female pt.;radiologist;co-worker;nurse

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking pelvic pneumograms and/or hysterosalpingograms of non-pediatric female pt. by reviewing request;preparing equipment;measuring pt.;taking scout film;assisting with induced pneumoperitoneum,instillation of contrast,fluoroscopy,spot films,video as ordered;setting technical factors;identifying film; positioning pt.;providing shielding;collimating;taking pelvic pneumograms,hysterosalpingograms as ordered;arranging for processing;presenting for review; continuing as ordered;having pt. returned or sent for recovery;placing radiographs for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient identification card, and any appropriate medical-technical history for a non-pediatric female patient scheduled for pelvic pneumography (radiography of the uterus, oviducts and ovaries after instillation of gas into the peritoneal cavity), pangynecography (pelvic pneumography followed by positive contrast study of pelvic female organs), or hysterosalpingography (positive contrast study of uterus (hysterography) and fallopian tubes) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Request may be for initial examination or may follow a prior radiographic study.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, and to check the completeness of the information provided:

    a. Performer checks the examination called for and the purpose:

        1) Notes whether request is for pelvic pneumography. If so, notes the recommended route

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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to induce the pneumoperitoneum (transvaginally, transuterinely, or transabdominally).

ii) Notes whether pelvic pneumography is to be followed by a positive contrast study (pangynecography or complete gynecography).

iii) Notes whether request is for a positive contrast study only. If so, notes whether for study of uterus and/or fallopian tubes.

b. Notes the name of the radiologist in charge; may note the name of the referring clinician.

c. Performer reads patient's name, identification number, age, weight, and height. Notes whether patient is in-patient or out-patient. Notes any special information, or note on known pathology that could affect patient positioning, technique, or handling. Notes whether patient has history of allergies, results of any prior allergy test. Notes whether patient may be in wheelchair.

d. Performer checks whether patient is suffering from a collateral condition requiring special handling such as communicable or infectious condition, infirmity, incoherence.

e. Performer may check record of patient's menstrual cycle and makes sure that patient is in appropriate stage of cycle, such as 8th or 9th day. May check that referring clinician has recorded that there is no current pregnancy, no indication of heart disease.

f. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done elsewhere in recent past, whether there i history of extensive radiography to bring to radiologist's attention.

ii) Checks whether any special orders on exposure factors are in keeping with the usual rad exposure involved for the examination.

g. Performer notes orders for prior preparation of patient such as cleansing enemas, douche, restricted morning food intake, prior administration of tranquilizer, analgesic and/or smooth muscle relaxant. May check whether these have been carried out; may check timing to be sure a proper elapse of time has occurred for medicatio to take effect. If appropriate, arranges to have any omitted steps carried out with delay in examination or plans to notify radiologist.

h. Notes whether procedure may include use of spot filming, videotape and/or overhead films.

i. If the performer determines that the request is not properly authorized, is incomplete, or that insufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer brings this to attention of radiologist in charge. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

j. If prior radiographs and/or ultrasonograms are to be presented to

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radiologist, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary:

   a. Washes hands as appropriate.
   b. Checks that procedure tray appropriate for the examination ordered has been prepared and equipment to induce pneumoperitoneum is in room if appropriate; may decide to prepare personally. May check that correct contrast material has been provided. If appropriate, may heat contrast to room or body temperature. Makes sure that emergency cart is present.
   c. Checks that proper accessories are available for procedure including leaded rubber shielding, gloves, and aprons, to be used by performer, the radiologist and/or anyone who will remain in the room during exposure. May check that x-ray tube has appropriate filtration.
   d. Checks that appropriate immobilization devices are present, that there is a mattress, pads, pillows and/or blankets for comfort of patient. May attach footboard or stirrups, shoulder supports and/or hand holds to table.
   e. Makes sure that right (R) and left (L) markers are available for use, identification cards, leaded numerals or markers and markers to indicate postinjection time intervals and positions.

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   f. Performer makes sure that upright cassette holder and an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Selects appropriate speed and type of film, grid, and cassette combination depending on the techniques to be used and standard institutional practices. Selects size based on patient's size and area of interest. If adequate supply is not in room, arranges to obtain or decides to obtain personally.
   g. Performer prepares for identification of overhead films using equipment provided by institution:

      i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.
      ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may type or write out ID information on card if not received with requisition.
      iii) Checks identification against requisition sheet.

   h. If any spot filming will utilize a camera attached to image intensifier and roll film, performer checks film supply indicator to make sure that there is sufficient film in the roll film cassette.

      i) If there is insufficient roll film in camera, performer arranges to have roll film cassette loaded, or decides to do personally.

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- ii) When loaded roll film cassette is obtained, performer checks loading in subdued light. Checks that end of film is cut correctly and is properly threaded and attached to takeup spool so that film unwinds appropriately. Checks that film is properly engaged in sprockets. Locks into operating position. If appropriate, cuts off excess film at exit port and removes. Attaches film cassette to camera and locks into place. Replaces camera cover.
- iii) If there is an adequate film supply, checks that film is properly loaded.
- iv) Performer advances film to compensate for any exposure of film due to installation or check.
- v) Removes dark slide from camera lens.
- vi) If not already done, performer writes or types a card with patient's identification information for use with spot film device. Inserts in slot in spot film camera as appropriate.

i. If any spot filming during examination will involve use of a cassette/bucky spot film device, performer checks that there is an adequate supply of appropriate size cassettes in room.

- i) If there is insufficient supply of cassettes, arranges to obtain or decides to obtain personally.
- ii) Performer carries out identification of the spot film cassettes as for overhead films.
- iii) Performer may use controls or manually pull out spot film bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Moves cassette into appropriate "stored" position.
- iv) If R-L markers are to be used with spot filming, performer tapes into place on image intensifier screen or plans to tape to patient's body.

j. If examination will include use of videotape, performer sets up magnetic tape cassette or video disc scanner for recording of image directly from the television monitor. Makes sure that there is sufficient tape. Prepares and checks replay mechanism. Sets controls at record position.

k. If a grid will be used with the image intensifier for fluoroscopy and/or spot filming, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

3. Performer reviews and sets technical exposure factors for overheads, fluoroscopy, and spot filming based on standards set by the institution for the examination involved:

   a. Dons protective leaded rubber garments such as apron and gloves.
   b. Makes sure that no one is in examination room or control room.
   c. Performer reviews the technique chart(s) for the unit(s) to be used:

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i) Locates information for the projections involved. Takes note of the exposure factors to be used for overheads and fluoroscopy. Considers preferences of the radiologist involved.

ii) Notes any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

iii) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs.

d. Performer makes sure that indicator light shows that x-ray generator is "warmed up" and ready for use. Makes sure that all circuits have been stabilized. If appropriate,checks line voltage meter, and, if needed, turns compensator dial until needle is aligned properly on line meter.

e. As appropriate,performer sets x-ray generator mode selector(s) for overhead scout film, for later use of fluoroscopic mode, and use of spot film camera or cassette device.

f. Performer sets controls on image intensifier for spot film camera or cassette device:

i) For spot film camera, performer selects and sets the rate (frames per second) for the camera according to standards set for examination.

ii) For cassette spot filming, performer may select and set a standard spot film program providing

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for format combinations such as single, half, or quarter combinations on a single cassette and related spot film sizes. Selects program appropriate for examination or awaits orders from radiologist.

g. If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

h. If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

i. Performer selects and sets expected exposure factors for fluoroscopy:

i) Selects and sets the kVp at the standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination.

ii) If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved.

iii) Sets fluoroscopic examination timer to maximum position.

j. If appropriate, performer selects and sets exposure factors for spot filming:

i) For conventional manual exposure control, performer selects and sets the appropriate spot film time for the examination.

ii) For automatic, phototimed,exposure control, performer selects a density exposure control appropriate for the examination.

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iii) Performer selects the appropriate mA for the examination and the focal spot size to be used.
iv) Performer selects and sets kVp by combining settings on one major and one minor kVp selector as appropriate for the examination.

4. If not already done, performer returns to examination room to set up x-ray and fluoroscope tube(s), image intensifier, collimator, and accessories, as appropriate, for check of equipment prior to examination:

   a. Makes sure that no one is in room.
   b. Places phantom or appropriate test object on radiography table where patient's area of interest will be centered for examination.
   c. Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.
   d. If not already done, moves image intensifier and any spot film device into position; centers (over or under) the area of interest.
   e. Performer adjusts the x-ray tube to appropriate focal spot-object distance (target to object distance, TOD). For fluoroscopy, adjusts distance between focal spot and image intensifier (focal spot to film distance, FFD). Makes sure that TOD is 15 inches or more. Operates controls or manually moves the x-ray tube(s) into place. Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD is obtained.
   f. Performer collimates fluoroscopy tube (and x-ray tube used for spot

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filming if different), depending on nature of the equipment and controls:

      i) Adjusts fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or sets shutter mode selector to automatic collimation.
      ii) Manually sets collimator for the spot film field size to be used, or selects and sets field size control to be used for automatic collimation with programmed spot film cassette exposure sequence.

5. If not already done, performer checks functioning of fluoroscopy equipment by entering remote control room or operating controls in examination room behind leaded screen:

   a. To check fluoroscopy mode, performer turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.

      i) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.
      ii) Checks mA meter and notes whether appropriate reading is obtained.
      iii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.
      iv) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when

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maximum examination exposure time is reached.

b. To check spot film functioning, performer may move cassette or roll film into x-ray exposure field using appropriate controls.

   i) Performer activates controls for spot film exposure. Notes whether cassette or roll film transport is operating appropriately. Notes whether exposure is terminated by phototimer or, if manual timer, in time set. If appropriate, releases spot film control after exposure.
   ii) If equipment is operating appropriately, performer unloads cassette and reloads or advances roll film as appropriate. Moves bucky into stored position.

c. After equipment has been checked performer shuts and resets for appropriate standard exposure factors. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

6. Performer readies patient for the examination:

   a. Performer washes hands as appropriate.
   b. Performer has the patient called from the holding area and prepared for the examination (if not already done), or decides to do personally.
   c. Depending on institutional arrangements, performer may decide to escort out-patient to or from dressing room. May decide to assist in transporting patient from holding area or have this done.

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   d. Performer greets patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. If patient is accompanied, performer checks with accompanying staff member on any special precautions necessary during procedure.
   e. Performer has patient assume a comfortable recumbent or seated position, as appropriate.

      i) If appropriate, places mattress, pillow or clean linen on x-ray table. May place pad, blanket or pillow under bony prominences to provide comfort for recumbent patient.
      ii) If patient is in wheelchair may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.
      iii) Performer may decide to assist patient from wheelchair to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.
      iv) If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.

   f. If not already done, has patient's clothing removed and provides gown or drape. May assist patient or request assistance from nurse. Permits patient to keep covered until measurements are taken and until examination by radiologist.
   g. If not already done, performer questions patient about preparatory

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procedures ordered. May question patient about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

h. Performer may make sure that an outpatient has made arrangements to be escorted home and to postpone normal activities for the day.

i. If appropriate and not already done, performer questions patient regarding possible pregnancy.

j. If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer plans to inform radiologist at once and proceeds only with approval.

k. If not already done, performer explains to patient what will be involved in the procedure:

  i) Performer explains what cooperation will be asked of patient. May describe procedure and what radiologist will be doing. Indicates what types of positions the patient will be asked to assume. May demonstrate how tilt table will be used and reassure patient that she will be held safely. Indicates that patient will be asked to empty bladder prior to examination.

  ii) Performer encourages patient to relax; may explain that tension can contribute to pain in examination.

  iii) Performer answers patient's nonmedical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Remains aware that patient may be frightened and apprehensive. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

l. Unless measurements have already been recorded, performer uses centimeter calipers to measure the thickness of the pelvis in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film in the likely positions to be ordered for overhead filming.

  i) Notes whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points are easy to find.

  ii) Records measurements for determining exposure factors for overheads.

  iii) Performer may tape R or L marker to patient if appropriate for use in spot filming.

m. Depending on institutional procedures, performer may have patient empty bladder at this point. Has patient void in bathroom or provides bedpan. May decide to assist patient.

n. Has patient relax in supine or dorsal lithotomy position on examination table depending on whether examination by radiologist will follow. Makes sure patient is draped and comfortable.

7. Performer informs attending radiologist when patient is ready to be examined. Brings requisition sheet, patient's medical history, chart, lab reports, any ultrasonograms, and any prior films to radiologist. Displays radiographs on view boxes.

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a. If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist.
b. Performer may accompany radiologist to examination room and introduce patient to radiologist.
c. Dons protective lead shielding, hospital gown and gloves when appropriate. Provides radiologist with lead apron and gloves.
d. During radiologist's review of requisition, prior films, and examination of patient, performer notes radiologist's orders:

   i) Performer may be asked to assist with catheterization of patient to empty bladder, or to assist with pelvic examination. Carries out appropriate sterile procedures; hands instruments and materials as appropriate.
   ii) When radiologist orders scout film (before or after pelvic examination) performer notes the patient position, projection, and central ray angulation ordered or plans to carry out standard procedure appropriate for pelvic pneumography or hysterosalpingography.

8. Unless already done, performer selects and sets the technical factors for the scout film:

a. Performer consults the technique chart posted for the machine. Locates the information needed for the body part and projection involved according to the centimeter thickness of the part as measured for the position and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed and use or nonuse of other accessories (such as screens, grids, bucky, etc.).
b. Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.
c. Once the standard kVp, mA and time have been determined, performer makes any conversions necessary to account for extreme fat or muscularity, the preference of the radiologist involved, and any other conversion needed such as posted changes. Performer looks up numerical conversion factors and calculates or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.
d. Performer sets the exposure factors as selected:

   i) Sets controls for radiography mode.
   ii) If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.
   iii) For conventional exposure control, performer sets the milliamperage selected for the correct focal spot size. Sets the selected exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.
   iv) For automatic phototimed exposure control, performer sets the category corresponding to the type of study and use of

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screens, bucky, etc.,and, if appropriate, focal spot size. Sets a control corresponding to the selected field size (as listed on technique chart for phototiming). May set a kVp range button, if called for with equipment, corresponding to the appropriate kV range for the examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustments of table, tube height, position, and collimator.

e. Performer obtains the appropriate size loaded cassette for the scout projection. Attaches identification information to the cassette or table top:

i) Places right or left marker on film holder or table-top as appropriate or depresses appropriate R or L button for automatic marking.

ii) If patient's identification information is in the form of lead numerals or marker, performer places on appropriate corner of cassette.

iii) If patient identification information is to be entered by use of flasher, sets flash card aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.

iv) Performer may place patient's card into card tray for equipment using automatic film marking device.

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v) Performer places cassette in bucky. May manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

f. Performer sets the focal-film distance (if not already done). Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD (TFD) is obtained.

9. Performer positions as follows (or as described below for later steps) depending on the position ordered or the examination procedure to be carried out:

a. Performer may explain or demonstrate to patient what is required. May obtain help in positioning.

b. Unless otherwise ordered, performer plans for a PA Trendelenburg projection (anterior view) of the pelvis when pelvic pneumography is ordered.

i) Has patient lie in a prone position on table with median sagittal plane centered to midline. Has patient arrange arms in comfortable position with shoulders and hips lying on single transverse planes. Has patient rest head on cheek or chin.

ii) Performer adjusts shoulder supports and footboard to patient's height. Secures patient's feet.

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iii) Centers film to the level of the coccyx by palpating for coccyx.

iv) Unless otherwise ordered, performer lowers head end of table 45°.

v) Directs central ray to the region of the coccyx at 15° caudad or a specified caudal angle.

c. Unless otherwise ordered, performer plans for an AP dorsal lithotomy projection (posterior view) of the pelvis when hysterosalpingography is ordered.

i) Has patient lie in a supine position on the table with median sagittal plane centered to midline. Has patient flex knees over padded leg rests in dorsal lithotomy position.

ii) Adjusts shoulders and hips so that they lie on single transverse planes. May have patient flex elbows and abduct arms. Abducts thighs to permit central ray to clear; may support each foot.

iii) Centers film to a point about two inches above the level of the symphysis pubis.

iv) Directs central ray at right angles to center of film or as directed.

d. Performer rehearses patient in breathing in, breathing out fully, and holding breath while remaining relaxed until told to breathe again.

e. Performer checks final positioning by using light in collimator Activates the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. Performer adjusts the collimator so that a small unexposed border will appear around the edge of the film or collimates further so as to expose only the area of interest (and thus provide maximum protection and detail). Adjusts primary beam to minimum size needed to cover the area(s) of interest.

f. Performer provides anyone who will remain in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

g. When everything is ready for the exposure, performer reminds patient of the cooperation and breath control to be used for exposure. Encourages patient to relax. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

10. Performer returns to control room.

a. Makes sure controls are properly set for radiography mode and that patient is still in position.

b. Tells patient when to take a deep breath, exhale and hold still while relaxing, as rehearsed, by calling or using intercom.

c. When respiration has been suspended, performer may wait one or two seconds and then makes exposure.

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d. Performer initiates exposure by pressing hand trigger or exposure control button.

   i) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.
   ii) May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction may decide to report; anticipates need to repeat exposure.
   iii) With phototimer notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure.
   iv) After exposure is completed tells patient that she can breathe normally.
   v) If the exposure is terminated by a circuit breaker, rechecks technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.

e. After exposure removes cassette and removes markers for further use.

f. The performer arranges to have the scout film processed at once or decides to do personally.

   i) Attaches ID card for use with flasher if appropriate. May sign requisition.
   ii) While the film is being processed and/or evaluated performer has patient relax in examination room or holding area. Explains what will happen next. If appropriate, makes sure that patient will be attended while waiting.
   iii) Performer places processed scout film on view box. May display prior films as well. Informs radiologist that scout is ready.

11. During radiologist's review of the scout film and examination of patient, performer notes radiologist's decisions and orders:

   a. If radiologist decides to terminate or delay procedure, performer proceeds to termination steps described below. If appropriate arranges to have proper forms filled out.
   b. If radiologist decides that additional cleansing or dilation of patient is needed, performer may arrange to have this carried out and/or performer arranges to reschedule patient.
   c. If radiologist indicates that the scout film is not technically adequate, performer notes radiologist's orders for change in technical factors, patient position, tube position, and/or centering of film.

      i) Notes whether problem is due to performer's own negligence or lack of attention so that performer can avoid "retakes."
      ii) If problem reflects malfunctioning equipment, performer reports malfunction to appropriate staff member.
      iii) If problem reflects the preference for density or

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contrast of the radiologist, performer notes for future use to avoid "retakes."

d. Performer notes radiologist's final orders on the procedures and sequence of the examination.

   i) Notes whether procedure will start with an induced pneumoperitoneum. If so, notes whether transvaginal, transuterine or transabdominal route will be used.
   ii) If positive contrast study is to follow pelvic pneumography or if examination is to be limited to positive contrast examination, performer notes orders on type of contrast and amount, whether fallopian tubes will be studied as well as uterus, and whether fractional filling will be employed.
   If not already done, has syringes prepared with contrast medium (iodine based solution) or decides to do personally. May check to see that temperature is appropriate. Warms if needed.
   iii) Discusses sequence and timing for procedure such as fractional filling with spot films and/or overheads with radiologist.
   iv) Notes radiologist's orders for program and settings for spot filming and sets or resets as appropriate. May arrange signals for exposure, changing of spot film cassettes, operation of exposure controls or table.
   v) Arranges to provide or change any equipment or supplies as ordered by radiologist.

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e. Performer sets technical factors for first postinjection overhead as described, adjusting for patient's position, radiologist's orders after viewing scout, and use of contrast material. Identifies first cassette as appropriate and places in bucky, adjusting centering as ordered.
f. Performer may position patient on examination table in supine or modified lithotomy position. May assist as patient is cleansed, using appropriate antiseptic technique.

12. If pneumoperitoneum is to be induced, performer stands by or assists while radiologist inserts appropriate instruments or places needle.

   a. When ordered, may assist in positioning patient in prone, partial knee-chest position (for transuterine route).
   b. When ordered, performer may repeat scout film (to determine nature of blockage in transuterine route). May assist with use of fluoroscopic controls (as described below for positive contrast).
   c. On orders performer may help position patient in prone position on table, supported by shoulder rests. Positions table to head down, Trendelenburg position at 15° or as ordered for completion of instillation of gas and to 45° when ordered after instillation is completed.
   d. May comfort patient during procedure.
   e. Performer notes orders for overhead films when pneumoperitoneum is accomplished.

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13. If overhead pelvic pneumograms are ordered, performer explains to patient what will be done. Repeats appropriate steps as for preliminary film if same position is ordered, adjusting technical factors as described above to account for use of gas contrast medium.

    a. When positioning a patient with a balloon catheter or opaque instruments in place, performer makes sure that clamp or opaque parts are not lying over or under the area of interest.
    b. For PA oblique projections (anterior views) of pelvic contents, performer notes side of interest and whether bilateral views are ordered.

        i) Starting with patient in prone position, performer elevates the side of interest about 30° and supports. Has patient rest head on cheek on opposite side with arm in comfortable position. Has patient support self on forearm and flexed knee.
        ii) Maintains table in Trendelenburg position and makes sure patient is held securely.
        iii) Centers film to the level of the coccyx.
        iv) Directs central ray vertically to enter the tip of the coccyx at the midpoint of the film or at caudal angle ordered.
        v) Reverses patient to elevate opposite side for second exposure if bilateral views are ordered.

    c. For lateral projections of pelvic contents, performer notes side of interest and whether bilateral views are ordered.

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        i) Has patient lie in prone position with table in Trendelenburg position.
        ii) Uses vertical bucky or cassette holder centered to the coronal plane at the pubic arch at the level of the coccyx.
        iii) Directs central ray horizontally across table at right angles to midpoint of film.
        iv) Reverses position of central ray and cassette for opposite side lateral view.
        v) Makes sure no one is in line with horizontal beam during exposure.

    d. Repeats appropriate steps including identification of cassette, use of R-L markers, collimation, breathing instructions, making exposure, and processing, as described above.
    e. Shows each pneumogram to radiologist as processed; proceeds as ordered until radiologist indicates that this stage of examination is completed.
    f. If appropriate, adjusts technical factors for continued overheads; repeats overheads as ordered if additional gas is injected.
    g. When pneumography is completed, performer notes radiologist's orders on continuation.

        i) If no further procedure will follow, performer may assist with removal of gas and termination as described below.
        ii) If delayed hysterosalpingography is ordered, performer may supply requisition sheet and terminate as described below.

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iii) If hysterosalpingography is to follow at once, performer notes orders and decisions on procedure as described in step 11,d (ii). Supplies any materials needed. Checks temperature of contrast medium.

14. If hysterography and/or hysterosalpingography is to be carried out as the main procedure or following pelvic pneumography, performer stands by or assists while radiologist inserts appropriate instruments or attaches a syringe with contrast medium to catheter already inserted during induced pneumoperitoneum.

    a. When ordered, may assist in positioning examination table and/or patient in prone position (after pelvic pneumography), or dorsal lithotomy position (for initial cleansing and insertion of instruments).
    b. If fluoroscopic monitoring of instillation (with or without fractional filling) is to be involved, performer may proceed as follows:

        i) Performer gives lead gloves and apron to radiologist. If appropriate, places leaded curtain in place. Makes sure that everyone remaining in room during exposure has appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.
        ii) On signal from radiologist, performer may dim room lights. Turns on TV power switch. May go to control room and operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders until visualization is adequate.
        iii) Performer may assist radiologist with spot filming. Operates exposure controls as ordered, or positions table,tube, or patient as ordered. If spot film attachment uses cassettes, performer may unload as used, identify, and insert additional cassettes, as described above, throughout procedure.
        iv) Depending on institutional procedures, performer may keep radiologist informed of cumulative exposure as shown on fluoroscope timer indicator.
        v) For fractional filling performer repeats appropriate steps as ordered.
        vi) Notes any orders for overhead films at end of each fractional injection and/or when instillation is completed. Notes projections, areas of interest, patient positions and tube angulation required.

15. For overhead hysterograms and/or hysterosalpingograms, performer positions as follows or as described earlier, depending on radiologist's orders. For patient with induced pneumoperitoneum, may position starting from the prone position, with table at Trendelenburg angulation as ordered.

    a. Performer is careful not to dislodge instruments left in place.
    b. For fractional filling performer marks each cassette to indicate the time elapse or amount of contrast instilled.
    c. Performer resets technical factors as appropriate for each pro-

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jection to account for use of contrast and any orders from radiologist after having reviewed scout and any later pneumograms.

d. Throughout procedure performer remains alert for any symptom of severe pain or adverse reaction to the contrast. As soon as performer judges that reaction may be severe, ceases exposure and notifies radiologist at once.

16. Performer positions as described above for scout films or for pneumography, or as follows, depending on orders:

a. For variations on AP lithotomy projection of pelvic contents, performer may adjust shoulder supports and footboard if not already done, position as for dorsal lithotomy position, but with table in 15° head down position or as ordered. May direct central ray at right angles to midpoint of film or at cephalad angle ordered.

b. For AP oblique projections of pelvic contents, performer starts with patient in supine position. Notes whether bilateral views are ordered or side of interest.

- i) Depending on side of interest, rotates patient about 30° and supports elevated side.
- ii) Centers the pubic arch on the side of interest to midline of table. Has patient extend and abduct upper thigh. Places arms in comfortable position with shoulders in a single transverse plane.
- iii) Centers film to a point about two inches above the symphysis pubis.
- iv) Directs central ray at right angles to midpoint of film or at angle specified.

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- v) Repeats for opposite side if bilateral study is ordered.

c. For lateral projections of pelvic contents performer may have patient lie in supine position.

- i) Uses vertical bucky or cassette holder centered to coronal plane at the pubic arch at a level about two inches above the symphysis pubis.
- ii) Directs central ray horizontally across table at right angles to midpoint of film.
- iii) Reverses position of central ray and cassette for opposite side lateral view.

d. Performer repeats collimation steps as appropriate as described above. For small fields performer attaches an auxiliary extension cone to collimator to further reduce the primary beam.

e. Performer rehearses patient in suspended exhalation. Makes exposure(s) as described above.

17. Performer arranges for processing and review of spot films and each overhead view as taken:

a. May sign or have radiologist sign requisition sheet.

b. Checks that equipment is turned off.

c. With cassette spot films and overhead exposures, removes any markers for further use. Attaches ID card for use with flasher if appropriate.

d. With spot film camera, performer advances the film so that all exposures made will be wound on the take-up spool in the roll film cassette. Replaces dark slide on camera lens. Uses device to cut

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film and create a light shield. Resets counter and removes film cassette.

e. Performer has overheads and spot films processed at once or decides to process personally.

f. While films are being processed, makes sure that patient is comfortable and, if necessary, attended by radiologist, staff member, or self.

g. When the overheads and spot films have been processed and returned, performer places on view boxes. May also hang scout and prior films. Informs radiologist that radiograph(s) are ready for viewing and makes note of radiologist's decisions:

   i) Notes orders for change in technical factors, change in patient positioning, centering and/or tube or table angulation.
   ii) Notes any decision by radiologist to inject more contrast and repeat any portion of the procedure.
   iii) Assists with any further use of fluoroscopy and/or videotape.
   iv) For further overhead exposures performer repeats appropriate steps including identification of cassette, use of R-L and series markers, selection and setting of technique, positioning patient and equipment for focus-object-film alignment, collimation, breathing instructions, making exposure, and processing, as described above.
   v) Performer refrains from commenting on the films or providing any interpretation to patient. Assists with patient who may be experiencing severe pain.
   vi) Performer shows subsequent radiographs to radiologist as processed. Continues as ordered

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until radiologist indicates that examination is completed or is to be terminated.

   vii) Notes any orders for delayed post-evacuation film(s). If so, performer may provide requisition sheet and have radiologist fill out and sign.

18. When radiologist indicates that procedure is to be terminated, if pneumoperitoneum has been induced, performer may assist with removal of gas and deflation of peritoneal cavity:

a. May help position patient in supine position if ordered.
b. May return table to Trendelenburg position if ordered.
c. May assist with dressing of puncture site.

19. When performer is told by radiologist that the examination has been completed, performer carries out termination steps for the examination:

a. If appropriate, reinforces physician's explanation of side effects to expect and need to consult gynecologist in case of severe pelvic pain or bleeding.
b. If delayed post-evacuation films have been ordered, explains appropriate timing and any prior preparations. With in-patient may arrange to have nursing staff in charge of patient's care informed.
c. Removes any markers from patient's body.
d. May have patient transported to recovery area to recline until immediate effects of procedure and medication have abated. Makes sure that none of the equipment is projecting over the patient before allowing patient to rise.

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e. If appropriate, makes sure that patient is in the care of a staff person who will transport to holding area, appropriate next location or, if out-patient, will arrange to discharge or send patient home (with escort if appropriate). f. May have room and equipment cleaned; has any other appropriate clean up procedures followed to avoid infection or contamination, or decides to do personally, depending on institutional procedures. g. Performer records the examination according to institutional procedures. May include date, room, examination type, the overhead views taken, the technical factors used, and film sizes. May record the number of spot films and overhead views taken including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet. h. Performer may record the fluoroscopy examination including exposure time and rad dosage. i. May present requisition form to physician for comments and signature. May present forms or requisitions for later delayed films and/or additional examination(s). j. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. k. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

TASK DESCRIPTION SHEET

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1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;instructed in breath control;film identified;technical factors selected and set;patient positioned;exposure made;radiographs sent for processing and evaluation; radiography repeated or continued as ordered;patient returned;examination recorded;radiographs placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, medical-technical history,prior radiographs;phone; view boxes;pen;sterile garments;x-ray generator,control panels,tube,bucky,table,collimator;ID,R-L markers;clean linens,towels;stethoscope;filter for primary beam;cassettes;emergency cart;extension cones; stool;calipers;shielding;immobilization devices; waterproof table covering;technique,standard view, tube rating and rad exposure charts;intercom; stretcher;wheelchair

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. **If "Yes" to q. 3:** Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Pregnant female;radiologist or clinician;nurse(s); co-workers

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking radiographs of a pregnant patient's abdomen for fetography,amniography,placentography,by reviewing request;reporting observed contraindications;reassuring,measuring pt.;instructing in breath control; selecting and setting technical factors;identifying film;positioning pt. and equipment;collimating;making exposure;having radiograph processed and reviewed;repeating or continuing as ordered;having pt. returned; placing radiographs for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a pregnant female patient scheduled for fetography (radiography of the fetus in utero), amniography (radiography of the gravid uterus after injection of an opaque medium into the amniotic fluid), or placentography (radiography of gravid uterus to locate placenta) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

1. Performer reads the requisition sheet to determine the examination called for, purpose, the patient involved, special considerations, and to check the completeness of the information provided:

    a. Performer checks the examination called for and the purpose. Notes the name of the radiologist in charge and/or the referring obstetrician. Notes the area of interest, the patient position(s) and projection(s) called for. Notes which projection is to be made first.
    b. Performer reads patient's name, identification number, age, weight. Notes

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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whether patient is in-patient, out-patient, and/or to be treated as emergency patient (such as with bleeding from vagina or imminent labor). Notes the patient's stage of pregnancy. Notes any special information such as collateral condition that will affect patient positioning, technique, or handling of the patient. Notes whether patient will be on a stretcher or in a wheelchair. Notes whether patient will be accompanied by nurse(s) or other staff person(s).

c. If an opaque medium has been ordered for injection into amniotic fluid prior to radiography, performer checks whether injection has taken place and notes the proper time elapse (24 to 48 hours) between injection and radiography,and checks whether proper time elapse has occurred. If there is no record of injection or insufficient time elapse, performer plans to report this to radiologist or appropriate staff member before proceeding.

d. Performer notes any orders for prior preparation of patient such as diet, use of cleansing enemas, and/or medication. May check whether these have been recorded as carried out. Plans to report omission of prior preparation to radiologist or appropriate staff member before proceeding.

e. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether radiography has been done elsewhere in recent past, whether number of radiographic exposures ordered or done in past should be reported to radiologist.

ii) Checks whether any special orders on exposure factors are in keeping with the usual rad exposure involved for the examination.

f. If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided, and proceeds after obtaining needed information, signature, or orders.

g. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. When performer is clear about what will be involved in examination, he or she prepares ahead so as not to keep patient in examination room or on x-ray table longer than necessary:

a. Performer goes to appropriate room for the type of examination involv-

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ed and the equipment required, or goes to room assigned on requisition sheet.

b. May check that equipment is appropriate to minimize radiation dosage and provide diagnostic quality radiographs. Checks that machine output is adequate, that filtration is available (for lateral uterine view), that extension cones and a Potter-Bucky diaphragm or a stationary grid is available.

c. Makes sure emergency cart and equipment is available for use in the case of onset of labor, bleeding, breaking of "bag of waters." Checks for stethescope. May place clean disposable and/or waterproof underpadding on table.

d. Washes hands as appropriate and plans to use sanitary technique.

e. Checks that proper accessories are available for procedure including leaded shielding to be used by anyone who will remain in the room during exposure, immobilization devices such as sandbags, wedge sponges,and a mattress, pads, pillows, and/or blankets for comfort of patient.

f. Performer prepares for identification of the films using equipment provided by institution:

  i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.

  ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may type or write out ID information on card if not received with requisition.

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  iii) Checks identification against requisition sheet.

  iv) Performer makes sure that right (R) and left (L) markers are available for use.

g. Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room.

  i) Selects appropriate speed and type of film, grid and cassette combination depending on the technique to be used and standard institutional practices for the examination. May obtain cassettes containing three unexposed films.

  ii) Selects size based on patient's size and the area of interest.

  iii) If adequate supply is not in room, arranges to obtain or decides to obtain personally.

h. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

i. Performer checks that x-ray equipment is ready for use. Goes to control panel and checks that indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for the machine to "warm up." If appropriate, performer may set radiography mode selector and set collimator control for manual operation. Makes sure that all circuits have been stabilized.

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3. Performer has the patient called from the holding area and prepared for the examination (if not already done), or decides to do personally.

   a. Performer washes hands as appropriate. Depending on patient's condition, may don sterile garments.
   b. Depending on institutional arrangements, performer may decide to escort out-patient to or from dressing room. May decide to assist in transporting patient from holding area or have this done.
   c. Performer greets patient and any accompanying staff person(s) and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. If patient is accompanied because of seriousness of condition or imminence of labor, performer checks with accompanying staff member(s) on any special precautions necessary during procedure.
   d. If not already done, has patient's clothing removed and provides gown or drape. May assist patient or request assistance from nurse. Permits patient to keep covered with gown until measurements are taken and until exposure.
   e. Performer has patient assume a comfortable recumbent or seated position, as appropriate.

      i) If appropriate, places waterproof or disposable mattress, pillow or clean linen on x-ray table. May place pad, blanket or pillow under bony prominences to provide comfort for recumbent patient.
      ii) If patient is in wheelchair may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.

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      iii) Performer may decide to assist patient from wheelchair or stretcher to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.
      iv) If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.
      v) If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table. May arrange to move or have patient moved to table.

   f. If not already done, performer questions patient or accompanying staff member about any preparatory procedures ordered; if any have been omitted and not recorded as approved, performer informs appropriate physician at once; proceeds only with approval.
   g. Performer explains to patient what will be involved in the procedure:

      i) Performer explains what cooperation will be asked of patient. Indicates that patient will empty bladder prior to examination if not already done. Indicates what types of positions the patient will be asked to assume.
      ii) Performer explains the breathing procedure to patient so that she can rehearse prior to final positioning (to avoid strain while in position). May have patient practice inhaling deeply several times when asked

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and then breathing in and holding until asked to relax. Has patient practice noticing when the fetus is quiet and informing performer.

h. If patient is not accompanied by a nurse, performer may check with patient who may be starting labor on regularity of contractions. May place hand on patient's abdomen just above umbilicus to feel contractions. Encourages patient to inform performer if the contractions become regular or increase in duration.

   i) If there is any sign that onset of labor has begun, performer immediately informs appropriate staff and works as rapidly as possible until told to stop. Avoids any contact of nonsterile objects with patient's vaginal area. Reassures patient and helps make her as comfortable as possible.
   ii) If patient is accompanied by nurse(s) continues procedure unless told to stop, and assists with care of patient as directed.

i. Performer answers patient's nonmedical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Remains aware that patient may be frightened, uncomfortable and/or in pain. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

j. If a frontal projection is ordered, performer may ascertain from RN or MD whether prone positioning is possible.

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k. Performer uses centimeter calipers to measure the thickness of the abdomen and/or hips at appropriate levels in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records measurements for determining exposure factors.

l. If not already done, performer may have patient empty bladder. Has patient void in bathroom or provides bedpan. May decide to assist patient or have this done.

m. Has patient relax until performer is ready for final positioning (just before actual exposure).

4. Performer sets up for the first (or next) exposure:

   a. Performer obtains the appropriate size loaded cassette for the first (or next) projection. Attaches identification information to the cassette or table top:

      i) Places right or left marker on film holder or table-top as appropriate or depresses appropriate R or L button for automatic marking.
      ii) If patient's identification information is in the form of lead numerals or marker, performer places on appropriate corner of cassette.

      iii) If patient identification information is to be entered by use of flasher, sets flash card aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
      iv) Performer may place patient's card into card tray for equip-

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ment using automatic film marking device.

- v) Performer places cassette in bucky. May manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

b. Performer selects the technical factors:

- i) Consults the technique chart posted for the machine. Locates the information needed for the body part and projection involved according to the centimeter thickness of the part and position as measured and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed and use of other accessories (such as screens, grids, bucky, etc.).
- ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.
- iii) Once the standard kVp, mA and time have been determined, performer makes any conversions necessary to account for use of soft tissue technique, presence of contrast if appropriate, the preference of the physician involved, and any other conversion needed such as posted changes. Performer looks up numerical conversion factors and calculates or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies,

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divides, adds, or subtracts as appropriate.

- iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output minimizing exposure time.

c. Performer sets the exposure factors as selected:

- i) Sets controls for radiography mode.
- ii) If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.
- iii) For conventional exposure control, performer sets the milliamperage selected for the correct focal spot size. Sets the selected exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.
- iv) For automatic phototimed exposure control, performer sets the category corresponding to the type of study and use of screens, bucky, etc., and, if appropriate, focal spot size. Sets a control corresponding to the selected field size (as listed on technique chart for phototiming).
  May set a kVp range button, if called for with equipment, corresponding to the appropriate

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kV range for the examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustments of table, tube height or position, and collimator.

d. Performer sets the focal-film distance. Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD (TFD) is obtained.

e. Performer provides everyone who will remain in room during exposure with protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

5. Performer prepares patient for the final position ordered for the first (or next) exposure.

a. Unless otherwise specified, performer first plans for frontal projection of the abdomen for amniography and fetography (in the PA prone position unless contraindicated);plans to take lateral view first for locating placenta.

b. Performer makes every effort to relieve any strain on patient. May explain or demonstrate to patient what is required. May obtain help in positioning.

c. Performer positions patient as follows (or as described below for later steps) depending on the position ordered.

d. For a PA projection (anterior view) of the gravid abdomen, performer helps the patient to lie in the prone position.

i) Adjusts pillows or foam rubber supports to elevate thorax and pelvis and avoid pressure on the abdomen.

ii) Centers the median sagittal plane of patient's body to the midline of table.

iii) Has patient rest head on chin. Supports ankles. Has patient flex elbows and adjust arms in a comfortable position.

iv) Centers film to the center of the uterus with lower border of film at the level of the tip of the coccyx unless otherwise ordered.

v) Directs central ray at right angles to midpoint of film.

e. For an AP projection (posterior view) of the gravid abdomen, performer helps the patient to lie in the supine position.

i) Centers the median sagittal plane of the body to the midline of table.

ii) Supports the knees and ankles to relieve strain; has patient abduct arms and place in comfortable position.

iii) Centers film to the level of the apex of the abdominal curve.

iv) Directs central ray at right angles to the midpoint of the film.

f. For a lateral projection of the gravid abdomen, performer notes whether right or left lateral is

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requested. May adjust filter to correct position for side of interest.

- i) Assists patient to lie on the side of interest so that a coronal plane passing halfway between the anterior axillary line and the anterior surface of the abdomen is centered to midline of table.
- ii) Adjusts patient in true lateral position. Supports knee next to table to prevent forward rotation of pelvis. May have patient flex elbows, place lower hand under head, and grasp side of table with opposite hand.
- iii) Centers film to the level of the apex of the abdominal curve.
- iv) Directs central ray at right angles to the midpoint of the film.

g. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. Adjusts the collimator so as to expose only the area of interest (and thus provide maximum protection and detail). If possible, attaches an auxiliary extension cone to collimate primary beam to the smallest size needed to cover the area of interest.

h. When everything is ready for the exposure, performer reminds patient of the cooperation and breath control to be used for exposure. Encourages patient to relax. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

6. Performer returns to control room:

a. Makes sure controls are properly set, that patient is still in position, and not having contraction.

b. Asks patient to indicate when fetus is quiet. When this is done, asks patient to breathe deeply several times as rehearsed, and then to breathe in and hold breath without moving.

c. Performer initiates exposure by pressing hand trigger or exposure control button.

d. While exposure is underway, performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

- i) May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction may decide to report; anticipates need to repeat exposure.
- ii) With phototimer notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure.
- iii) After exposure is completed tells patient that she can breathe and relax.
- iv) If the exposure is terminated by a circuit breaker, rechecks technical factors for possible overload or checks for over-

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load elsewhere on circuit. Anticipates need to repeat exposure.

v) After exposure removes cassette and removes markers for further use.

7. Unless a second view is required before evaluation by the radiologist or clinician involved, the performer arranges to have the first film processed at once or decides to do personally.

   a. Attaches ID card for use with flasher if appropriate. May sign requisition.
   b. If appropriate while the film is being processed and/or evaluated, performer has patient relax in examination room or holding area. Explains what will happen next. If appropriate, makes sure that patient will be attended while waiting.
   c. Depending on institutional procedures, performer brings the processed radiograph directly to the physician in charge, places it on a view box, and informs physician that the radiograph is ready, or awaits results of quality review and further orders.
   d. If the physician or a staff member indicates that there is any problem with the technical factors or the patient positioning, performer records or notes for later use in the examination and/or repeats preliminary radiography as ordered.

8. Throughout procedure performer observes patient for any signs of emergency and/or to prevent or respond to an accident. Is alert to signs of onset of labor such as irregular contractions becoming regular, or rupture of "bag of waters."

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a. If the amniotic membranes rupture and there is a watery gush of fluid from the vagina, performer does not attempt to wipe away secretions from vagina unless sterile procedure can be followed. If patient is not in care of nurse, performer may proceed as follows:

   i) Reports at once to proper staff member.
   ii) Keeps patient lying down.
   iii) Places clean towel under buttocks to absorb moisture.
   iv) May check that fetal heart can be heard using stethoscope.

b. If patient is not attended by nurse and contractions appear to be regular, performer may time contractions and proceed quickly with examination unless the onset of the second stage of labor appears to be occurring.

   i) Performer may time contractions by placing hand on abdomen above umbilicus. Times seconds of duration of contraction from first tightening to complete relaxation. Times minutes of intervals from start of one contraction to another.
   ii) Performer judges patient to be at end of first stage when the contractions last about a minute or longer and come at 3 to 4 minute intervals.
   iii) During first stage of labor, performer encourages mother to relax with each contraction using abdominal or quiet breathing with mouth closed. Encourages patient not to bear down or attempt to push.

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iv) If performer judges that patient is at end of first stage of labor, arranges at once to have patient taken to obstetrics. Makes sure patient does not attempt to walk and makes sure that patient is attended.

c. If patient is accompanied by nursing staff, assists as appropriate with emergency care.

d. If patient shows any other emergency signs, loses consciousness, or has an accident, performer calls appropriate physician or staff member at once. May decide to provide emergency first aid as well.

9. When (or if) performer learns that further views and/or positions are to be undertaken, eliminated or altered, performer proceeds as appropriate according to instructions.

a. For further exposures performer repeats appropriate steps for next view(s) including identification of film holder or cassette and use of R-L marker, selection and setting of technique for next view (if different), and positioning equipment for focus-object-film alignment.

b. Performer refrains from commenting on the films or providing any interpretation.

c. If performer is asked to repeat any exposures, makes sure that the additional exposure is warranted medically, since additional radiation will be incurred.

i) Notes whether need to repeat is due to performer's own negligence or lack of attention so that performer can avoid future "retakes."

ii) If request for retake reflects malfunctioning equipment, performer reports malfunction to appropriate staff member.

iii) If request for retake reflects the preference for density or contrast of the physician, performer notes for future work done for the given physician so that retakes can be avoided.

d. Performer positions for further exposures as ordered as described above or as follows:

e. If an oblique projection of the gravid abdomen is ordered, performer notes whether patient is to be rotated with right or left side elevated, based on physician's evaluation of frontal view.

i) Performer rotates patient with the appropriate side elevated the number of degrees requested.

ii) Supports elevated shoulder and hip, with arms comfortably placed and shoulders lying in a single transverse plane. Centers film at the level of the apex of the abdominal curve.

iii) Directs central ray at right angles to midpoint of film or as ordered.

f. Performer repeats breathing instructions, collimation, and makes further exposure(s) as described above. Has these processed and presented for review or takes to radiologist as they are processed. Continues as ordered until told that the radiography is completed.

10. When performer is told that the examination has been completed, performer carries out termination steps for the examination:

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a. Performer may assist patient from table. Makes sure patient is reminded of any footrest in stepping off table. Makes sure that none of the equipment is projecting over the patient before allowing patient to rise from table, and assists patient.

b. Performer may have patient transported to next assigned location, or decides to do personally, as appropriate. If appropriate, makes sure that patient is in the care of staff person(s) who will transport to appropriate next location or, if out-patient, will arrange to discharge or send patient home, with escort if appropriate.

c. Performer may have room and equipment cleaned; has secretions removed with disinfectant; may decide to do personally. Has any other appropriate clean up procedures followed to avoid infection or contamination, or decides to do personally, depending on institutional procedures.

d. Performer records the examination according to institutional procedures. May include date, room, examination type, the overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each overhead view including retakes; may enter the estimated radiation dose to which patient and fetus were exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.

e. May present requisition form to physician for comments and signature.

f. Performer may decide to jacket radiographs, requisition sheets, and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures.

g. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured,instructed in breath control;film identified;technical factors selected and set;patient positioned;metal grid positioned;exposure made;radiograph sent for processing and evaluation;radiography repeated or continued as ordered under sterile conditions;radiographic examination recorded;radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, medical-technical history,prior radiographs;phone; view boxes;pen;sterile garments;x-ray generator,control panels,tube,bucky,table,collimator;ID,R-L markers;cassettes;emergency cart;metal grid;extension cones;stool;calipers;shielding;immobilization devices;technique,standard view,tube rating and rad exposure charts;intercom;stretcher;wheelchair

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Pregnant female;radiologist;obstetrician;nurse(s); co-workers

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking radiographs of a pregnant patient's uterus for intrauterine transfusion,by reviewing request; cleaning equipment;reassuring,measuring pt.;instructing in breath control;selecting and setting technical factors;placing metal grid as ordered;identifying film;positioning pt. and equipment;collimating; making exposure;having radiograph processed and reviewed;repeating or continuing for needle check using sterile procedures as ordered;recording examination; placing radiographs for use.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a pregnant female patient scheduled for intrauterine fetal radiography such as in connection with intrauterine transfusion (IUT) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Performer may also receive prior radiographs if the procedure is one of a series, and/or ultrasonograms, scintillation scans, or radiographs showing the location of the placenta.

1. Performer reads the requisition sheet to check the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for and the purpose. Notes the sterile procedure room assigned and its location; checks the time for the scheduled procedure, and, if (or as) appropriate, the time to report for preliminary preparations.

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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Notes the names of the radiologist and/or obstetrician in charge. b. Performer reads patient's name, identification number, age, weight. Notes whether patient is in-patient or out-patient. Notes the patient's stage of pregnancy. Notes any special information or collateral condition that could affect patient positioning, technique, or handling of patient. Notes whether patient will be on a stretcher or in a wheelchair. Notes whether patient will be accompanied by nurse(s) or other staff person(s). c. Performer checks whether the prior injection of an opaque medium into patient's amniotic fluid has taken place and whether the proper amount of time has elapsed since injection. If there is no record of injection or insufficient time elapse, performer plans to report this to radiologist or to appropriate staff member before proceeding. May arrange to reschedule patient if so ordered. d. Performer notes any orders for prior preparation of patient such as diet, use of cleansing enemas, and/or sedation. May check whether these have been recorded as carried out. Plans to report omission of prior preparation to radiologist or appropriate staff member before proceeding. e. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete. Checks whether any special orders on exposure factors are in keeping with the usual rad exposure involved for the examination. f. If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for	performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided, and proceeds after obtaining needed information, signature, or orders. g. Performer checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used. h. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered. 2. Performer may go to appropriate procedure room to prepare equipment and materials for the procedure: a. Performer may check that equipment is appropriate to minimize radiation dosage and provide maximum information. Checks that machine output is adequate, that filter is available for lateral view, that extension cones and a Potter-Bucky diaphragm or a stationary grid is available. Checks that metal grid frame and tape is available to place over patient's abdomen.

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b. Performer prepares damp cloths with appropriate antiseptic and/or disinfectant solutions. Makes sure unit is disconnected, and wipes equipment thoroughly to remove dirt, dust and lint. Washes hands afterwards as appropriate.

c. Checks that proper accessories are available for procedure including leaded shielding to be used by anyone who will remain in the room during exposure, immobilization devices such as sandbags, wedge sponges and a mattress, pads, pillows, and/or blankets for comfort of patient.

d. Performer prepares for identification of the films using equipment provided by institution:

  i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.
  ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may type or write out ID information on card if not received with requisition.
  iii) Checks identification against requisition sheet.
  iv) Performer makes sure that right (R) and left (L) markers are available for use.

e. Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room.

  i) Selects appropriate speed and type of film, grid and cassette combination depending on the technique to be used and standard institutional practices.
  ii) Selects size based on patient's size and the area of interest.
  iii) If adequate supply is not in room, arranges to obtain or decides to obtain personally.

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f. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

g. Performer checks that x-ray equipment is ready for use. Goes to control panel and checks that indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for the machine to "warm up." If appropriate, performer may set radiography mode selector and set collimator control for manual operation. Makes sure that all circuits have been stabilized.

3. Unless physician will see patient first, has patient called from the holding area and prepared for the examination (if not already done), or decides to do personally.

  a. Performer washes hands as appropriate.
  b. Depending on institutional procedures, performer may decide to escort out-patient to or from dressing room. May decide to assist in transporting patient from holding area or have this done.
  c. Performer greets patient and any accompanying staff person(s) and introduces self. Checks patient's

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identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. If patient is accompanied by staff personnel, performer checks on any special precautions necessary during procedure.

d. If not already done, has patient's clothing removed and provides gown or drape. May assist patient or request assistance from nurse. Permits patient to keep covered with gown until measurements are taken or until examination.

e. Performer has patient assume a comfortable recumbent or seated position, as appropriate.

- i) If appropriate, places waterproof or disposable mattress, pillow or clean linen on x-ray table. May place pad, blanket or pillow under bony prominences to provide comfort for recumbent patient.
- ii) If patient is in wheelchair may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.
- iii) Performer may decide to assist patient from wheelchair or stretcher to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.
- iv) If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.
- v) If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted

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with patient on it from wheeled base to x-ray table. May arrange to move or have patient moved to table.

f. If not already done, performer questions patient or accompanying staff member about any preparatory procedures ordered; if any have been omitted and not recorded as approved, performer informs appropriate physician at once; proceeds only with approval.

g. Performer explains to patient what will be involved in the procedure:

- i) Performer explains what cooperation will be asked of patient. Indicates that patient will empty bladder prior to examination if not already done. Indicates what types of positions the patient will be asked to assume.
- ii) Performer explains the breathing procedure to patient so that she can rehearse prior to final positioning (to avoid strain while in position). May have patient practice inhaling deeply several times when asked and then breathing in and holding until asked to relax. Has patient practice informing performer when the fetus is quiet.

h. Performer answers patient's nonmedical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Remains aware that patient may be frightened, uncomfortable and/or in pain. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

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- i. Performer uses centimeter calipers to measure the thickness of the abdomen and hips at appropriate levels in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film.
  Records measurements for determining exposure factors.
- j. If not already done, performer may have patient empty bladder. Has patient void in bathroom or provides bedpan. May decide to assist patient or have this done.
- k. Has patient relax until radiologist and obstetrician examine patient.

4. Unless performer is to join radiologist and obstetrician in examination room, performer notifies radiologist and obstetrician as appropriate when patient is ready to be examined.

   - a. Brings requisition sheet, patient's medical history, chart, any placenta localization films or scans and any prior films to radiologist. Displays radiographs on view boxes.
   - b. If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided.
   - c. Performer may accompany radiologist to examination room and introduce patient to radiologist. Greets obstetrician as appropriate.

5. During patient's examination performer sets up for the first radiograph:

   - a. Performer obtains the appropriate size loaded cassette for the projection. Attaches to the cassette or table top:

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     - i) Places right or left marker on film holder or table-top as appropriate or depresses appropriate R or L button for automatic marking.
     - ii) If patient's identification information is in the form of lead numerals or marker, performer places on appropriate corner of cassette.
     - iii) If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
     - iv) Performer may place patient's card into card tray for equipment using automatic film marking device.
     - v) Performer places cassette in bucky. May manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

   - b. Performer selects the technical factors:

     - i) Consults the technique chart posted for the machine. Locates the information needed for the body part and projection involved according to the centimeter thickness of the part and position as measured and the collimated field size to be used. Makes sure that technique

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relates to the combination of film type and speed and use of other accessories (such as screens, grids, bucky, etc.).

ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.

iii) Once the standard kVp, mA and time have been determined, performer makes any conversions necessary to account for use of soft tissue technique, presence of contrast, the preference of the radiologist involved, and any other conversion needed such as posted changes. Performer looks up numerical conversion factors and calculates or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.

iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output, minimizing exposure time.

c. Performer sets the exposure factors as selected:

i) Sets controls for radiography mode.

ii) If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

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iii) For conventional exposure control, performer sets the milliamperage selected for the correct focal spot size. Sets the selected exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

iv) For automatic phototimed exposure control, performer sets the category corresponding to the type of study and use of screens, bucky, etc., and, if appropriate, focal spot size. Sets a control corresponding to the type of study and use of screens, bucky, etc., and, if appropriate, focal spot size. Sets a control corresponding to the selected field size (as listed on technique chart for phototiming).
May set a kVp range button, if called for with equipment, corresponding to the appropriate kV range for the examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustments of table, tube height or position, and collimator.

d. Performer sets the focal-film distance. Operates controls or manually moves the x-ray tube into place over the film holder. Checks the focal-film distance by reading

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indicator scale in the tube housing; adjusts up or down until the required FFD (TFD) is obtained.

e. Performer provides everyone who will remain in room during exposure with protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

6. On orders from radiologist performer proceeds with localization radiograph of the fetus:

    a. Determines from obstetrician the placement required for the grid. Places stainless steel grid over the patient's abdomen and uterus as ordered. Tapes into position from behind with radiolucent tape.
    b. Performer makes every effort to relieve any strain on patient. May explain or demonstrate to patient what is required. May obtain help in positioning.
    c. For an AP projection (posterior view) of the gravid uterus, performer adjusts the patient in the supine position on the x-ray table.

        i) Centers the median sagittal plane of the body to the midline of table.
        ii) Supports the knees and ankles to relieve strain. Has patient abduct arms and place in comfortable position.
        iii) Centers film to the level of the apex of the abdominal curve.
        iv) Directs central ray at right angles to the midpoint of the film.

    d. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. Adjusts the collimator so as to expose only the area of interest (and thus provide maximum protection and detail). If possible, attaches an auxiliary extension cone to collimate further to reduce the primary beam to the smallest size needed to cover the area of interest.
    e. When everything is ready for the exposure, performer reminds patient of the cooperation and breath control to be used for exposure. Encourages patient to relax. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.
    f. Performer returns to control room:

        i) Makes sure controls are properly set, and that patient is still in position.
        ii) Asks patient to indicate when fetus is quiet. When this is done, asks patient to breathe deeply several times as rehearsed, and then to breathe in and hold breath without moving.

    g. Performer initiates exposure by pressing hand trigger or exposure control button.

        i) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

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- ii) May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction may decide to report; anticipates need to repeat exposure.
- iii) With phototimer notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure.

h. After exposure is completed tells patient that she can breathe and relax.

- i) If the exposure is terminated by a circuit breaker, rechecks technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.
- ii) Removes cassette and removes markers for further use.

7. The performer arranges to have the radiograph processed at once or decides to do personally.

a. Attaches ID card for use with flasher if appropriate. May sign requisition.
b. While the film is being processed and/or evaluated, performer has patient relax. If appropriate, makes sure that patient will be attended while waiting.
c. When radiograph has been processed, performer displays on view box and informs radiologist that it is ready. May also display existing views of the placenta. Awaits radiologist's further orders.
d. If the radiologist indicates that there is any problem with the technical factors or the patient positioning, performer records or notes for later use in the examination and/or repeats radiography as ordered.

- i) Notes whether order to repeat is due to performer's own negligence or lack of attention so that performer can avoid future "retakes."
- ii) If order for retake reflects malfunctioning equipment, performer reports malfunction to appropriate staff member.
- iii) If order for retake reflects the preference for density or contrast of the radiologist, performer notes for future work to avoid future "retakes."
- iv) If radiologist orders "retakes," performer adjusts settings or patient position as appropriate and repeats as described above.

8. If radiologist orders a lateral projection of the gravid uterus, performer notes whether right or left lateral is requested. May adjust filter in beam column to correct position for side of interest.

a. Resets technical factors as appropriate; identifies film and uses R-L marker as described above.
b. Assists patient to lie on the side of interest so that a coronal plane passing halfway between the anterior axillary line and the anterior surface of the abdomen is centered to midline of table.
c. Adjusts patient in true lateral position. Supports knee next to table to prevent forward rotation of pelvis. May have patient flex elbows, place lower hand under head, and grasp side of table with opposite hand.

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d. Centers film to the level of the apex of the abdominal curve.
e. Directs central ray at right angles to the midpoint of the film.
f. Performer repeats breathing instructions, collimation, and makes any further exposure(s) as described above. Has each film processed and takes to radiologist as soon as processed. Continues as ordered until told that the localization radiography is completed.

9. Performer prepares for further radiography while patient is prepared for the sterile puncture procedure.

   a. Performer may obtain or receive a clean hospital gown, cotton "boots," cap, and mask from a staff member. Dons these before entering sterile area.
   b. Washes hands as appropriate.
   c. Carries out appropriate steps to maintain the integrity of the sterile area of the procedure room and does not touch patient, drapes, obstetrician, radiologist, nurses or instrument tables.

10. During preparation of patient performer positions cassette for exposure. Checks needle placement when ordered.

   a. Performer sets or checks technical factors for overhead as described, adjusting for patient's position and radiologist's orders after viewing first radiograph.
   b. Inserts properly identified cassette into bucky and centers as appropriate under sterile drape.
   c. After radiologist inserts puncture needle, performer may stand by as radiologist positions x-ray tube, or performer positions as ordered. Repeats collimation as appropriate as described above. Repeats breathing instructions, and makes exposure as described above.

List Elements Fully

   d. After exposure performer returns to patient. If patient has been draped, has sterile drape raised to expose cassette holder. Removes cassette.
   Removes any markers for further use.
   e. Has radiograph processed and displays on view box in appropriate nonsterile area of room. May also hang AP and/or lateral views. Informs radiologist and obstetrician when ready.
   f. Repeats if necessary as ordered.

11. Performer stands by as appropriate until told that radiography for the procedure has been completed. May remain during transfusion depending on institutional procedures. Terminates when appropriate:

   a. Performer may clean the x-ray equipment after use. Washes hands as appropriate. Removes sterile garments.
   b. Performer records the radiography according to institutional procedures. May include date, procedure room, name of procedure, the views taken, the technical factors used, and film sizes; may record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient and fetus were exposed (using posted information on dosage); may record any problem with equipment. Signs requisition sheet.
   c. May present requisition sheet to radiologist for comments and signature.
   d. Performer may arrange to jacket films, requisition sheets, and related materials and/or have information recorded in log book, depending on institutional procedures.

TASK DESCRIPTION SHEET (continued)

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This is page 10 of 10 for this task.

List Elements Fully	List Elements Fully
e. May report to supervisor or nurse in charge of room that radiography is completed. f. May indicate to appropriate staff person when the performer is ready to proceed with next radiographic procedure.	

TASK DESCRIPTION SHEET

Task Code No. 468

This is page 1 of 11 for this task.

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured,instructed in breath control;film identified;technical factors selected and set;patient and Colcher-Sussman pelvimeter positioned;exposures made;radiographs sent for processing and evaluation;radiography repeated or continued as ordered;patient returned;examination recorded;radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, medical-technical history,prior radiographs;phone; view boxes;pen;sterile garments;x-ray generator,control panels,tube,bucky,table,collimator;ID,R-L markers;clean linens,towels;stethoscope;filter for primary beam;cassettes;emergency cart;extension cones; calipers;shielding;immobilization devices;compression band;Colcher-Sussman pelvimeter;pelvimeter stand; vertical bucky;waterproof table covering;technique, standard view,tube rating and rad exposure charts; intercom;stretcher;wheelchair

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Pregnant female;radiologist or obstetrician;nurse(s); co-workers

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking radiographs of a pregnant patient's pelvis for Colcher-Sussman pelvimetry, by reviewing request; reporting observed contraindications;reassuring,measuring pt.;instructing in breath control;selecting and setting technical factors;identifying film;positioning pt.,Colcher-Sussman pelvimeter and equipment;collimating;making exposures;having radiographs processed and reviewed;repeating or continuing as ordered; having pt. returned;placing radiographs for use;recording examination.

List Elements Fully

Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a pregnant female patient scheduled for the Colcher-Sussman method of radiographic pelvimetry (use of special ruler in radiography of gravid pelvis to compare size and volume of maternal pelvis with fetal head) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

1. Performer reads the requisition sheet to determine the examination called for, purpose, the patient involved, special considerations, and to check the completeness of the information provided:

   a. Performer checks the examination called for and the patient's stage of pregnancy. Notes the name of the radiologist or the referring obstetrician to whom radiographs are to be delivered for interpretation.
   b. Performer reads patient's name, identification number, age, weight. Notes whether patient is in-patient, out-patient, and/or to be treated as emergency patient (such as patient already in labor or bleed-

OK-RP;RR;RR;

6. Check here if this is a master sheet..(x)

TASK DESCRIPTION SHEET (continued)

Task Code No. 468

This is page 2 of 11 for this task.

List Elements Fully

ing from vagina). Notes presence of any collateral condition that will affect positioning, technique, or handling of the patient. Notes whether patient will be on a stretcher or in a wheelchair. Notes whether patient will be accompanied by nurse(s) or other staff person(s).

c. Performer notes whether standard AP and lateral projections are ordered; side of interest,and whether recumbent or standing for lateral view; notes type of suspended respiration ordered and use or nonuse of compression band.

d. Performer notes any orders for prior preparation of patient such as diet, use of cleansing enemas, and/or medication. May check whether these have been recorded as carried out. Plans to report omission of prior preparation to radiologist or appropriate staff member before proceeding.

e. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete.

  i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether radiography has been done elsewhere in recent past, whether number of radiographic exposures ordered or done in past should be reported to the physician in charge.

  ii) Checks whether any special orders on exposure factors are in keeping with the usual rad exposure involved for the examination.

List Elements Fully

f. If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to the physician's attention. Notes any special orders or change in procedure decided, and proceeds after obtaining needed information, signature, or orders.

g. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

h. Performer may prepare appropriate charts and papers (for use in interpretation) for delivery to physician in charge.

2. When performer is clear about what will be involved in examination, he or she prepares ahead so as not to keep patient in examination room or on x-ray table longer than necessary:

  a. Performer goes to appropriate room for the type of examination involved and the equipment required, or goes to room assigned on requisition sheet.

TASK DESCRIPTION SHEET (continued)

Task Code No. 468

This is page 3 of 11 for this task.

List Elements Fully

b. May check that equipment is appropriate to minimize radiation dosage and provide diagnostic quality radiographs. Checks that machine output is adequate, that filtration is available (for lateral view), that extension cones and a Potter-Bucky diaphragm or a stationary grid is available.

c. Makes sure that Colcher-Sussman pelvimeter is present. If erect lateral view is required, may check for vertical bucky and non-skid level stand for placement of pelvimeter. May decide to clean pelvimeter with antiseptic solution.

d. Makes sure emergency cart and equipment is available for use in the case of onset of labor, bleeding, breaking of "bag of waters." Checks for stethescope. May place clean disposable and/or waterproof under-padding on table.

e. Washes hands as appropriate and plans to use sanitary technique.

f. Checks that proper accessories are available for procedure including leaded shielding to be used by anyone who will remain in the room during exposure, immobilization devices such as sandbags, wedge sponges, compression band, and a mattress, pads, pillows, and/or blankets for comfort of patient.

g. Performer prepares for identification of the films using equipment provided by institution:

  i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.

  ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may type or write out ID information on card if not received with requisition.

List Elements Fully

  iii) Checks identification against requisition sheet.

  iv) Performer makes sure that right (R) and left (L) markers are available for use.

h. Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room.

  i) Selects appropriate speed and type of film, grid and cassette combination depending on the technique to be used and standard institutional practices for the examination.

  ii) Selects size based on patient's size and the area of interest.

  iii) If adequate supply is not in room, arranges to obtain or decides to obtain personally.

i. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

j. Performer checks that x-ray equipment is ready for use. Goes to control panel and checks that indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for the machine to "warm up." If appropriate, performer may set radiography mode selector and set col-

TASK DESCRIPTION SHEET (continued)

Task Code No. 468

This is page 4 of 11 for this task.

List Elements Fully	List Elements Fully
limator control for manual operation. Makes sure that all circuits have been stabilized. 3. Performer has the patient called from the holding area and prepared for the examination (if not already done), or decides to do personally. a. Performer washes hands as appropriate. Depending on patient's stage of pregnancy, may don sterile garments. b. Depending on institutional arrangements, performer may decide to escort out-patient to or from dressing room. May decide to assist in transporting patient from holding area or have this done. c. Performer greets patient and any accompanying staff person(s) and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. If patient is accompanied because of seriousness of condition or onset of labor, performer checks with accompanying staff member(s) on any special precautions necessary during procedure. d. If not already done, has patient's clothing removed and provides gown or drape. May assist patient or request assistance from nurse. Permits patient to keep covered with gown until measurements are taken and until exposure. e. Performer has patient assume a comfortable position, as appropriate. i) If appropriate, places waterproof or disposable mattress, pillow or clean linen on x-ray table. May place pad, blanket or pillow under bony prominences to provide comfort for recumbent patient.	ii) If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in locked position. iii) Performer may decide to assist patient from wheelchair or stretcher to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient. iv) If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table. v) If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table. May arrange to move or have patient moved to table. f. If not already done, performer questions patient or accompanying staff member about any preparatory procedures ordered; if any have been omitted and not recorded as approved, performer informs appropriate physician at once; proceeds only with approval. g. Performer explains to patient what will be involved in the procedure: i) Performer explains what cooperation will be asked of patient. Indicates that patient will empty bladder prior to examination if not already done. Indicates what types of positions the patient will be asked to assume. ii) Performer explains the breathing procedure to patient so

TASK DESCRIPTION SHEET (continued)

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This is page 5 of 11 for this task.

List Elements Fully

that she can rehearse prior to final positioning (to avoid strain while in position). May have patient practice inhaling deeply several times when asked and then breathing in and holding, or breathing out and holding, until asked to relax. Has patient practice noticing when the fetus is quiet and informing performer.

h. If patient is not accompanied by a nurse, performer may check with patient who may be starting labor on regularity of contractions. May place hand on patient's abdomen just above umbilicus to feel contractions. Encourages patient to inform performer if the contractions become regular or increase in duration. Plans to suspend procedural steps during contractions.

  i) If there is any sign that onset of labor has begun and this is not recorded, performer immediately informs appropriate staff and works as rapidly as possible until told to stop. Avoids any contact of nonsterile objects with patient's vaginal area. Reassures patient and helps make her as comfortable as possible.
  ii) If patient is accompanied by nurse(s), continues procedure unless told to stop, and assists with care of patient as directed.

i. Performer answers patient's nonmedical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Remains aware that patient may be frightened, uncomfortable and/or in pain. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

List Elements Fully

j. Performer has patient assume recumbent and erect positions (if erect lateral is ordered), and uses centimeter calipers to measure the thickness of the abdomen and/or hips at appropriate levels in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records measurements for determining exposure factors.
k. If not already done, performer may have patient empty bladder. Has patient void in bathroom or provides bedpan. May decide to assist patient or have this done.
l. Has patient relax until performer is ready for final positioning (just before actual exposure).

4. Performer sets up for the first (or next) exposure:

  a. Performer obtains the appropriate size loaded cassette for the first (or next) projection. Attaches identification information to the cassette or table top:

    i) Places right or left marker on film holder or table-top as appropriate or depresses appropriate R or L button for automatic marking.
    ii) If patient's identification information is in the form of lead numerals or marker, performer places on appropriate corner of cassette.
    iii) If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.

TASK DESCRIPTION SHEET (continued)

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This is page 6 of 11 for this task.

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iv) Performer may place patient's card into card tray for equipment using automatic film marking device.

v) Performer places cassette in bucky. May manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

b. Performer selects the technical factors:

i) Consults the technique chart posted for the machine. Locates the information needed for the body part and projection involved according to the centimeter thickness of the part and position as measured and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed and use of other accessories (such as screens, grids, bucky, etc.).

ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.

iii) Once the standard kVp, mA and time have been determined, performer makes any conversions necessary to account for use of soft tissue technique, the preference of the physician involved, and any other conversion needed such as posted changes. Performer looks up numerical conversion factors and calculates or uses conversion charts to ascertain the appropriate

List Elements Fully

new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.

iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output minimizing exposure time.

c. Performer sets the exposure factors as selected:

i) Sets controls for radiography mode.

ii) If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

iii) For conventional exposure control, performer sets the milliamperage selected for the correct focal spot size. Sets the selected exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

iv) For automatic phototimed exposure control, performer sets the category corresponding to the type of study and use of screens, bucky, etc., and, if appropriate, focal spot size. Sets a control corresponding to the selected field size (as listed on technique chart for phototiming).

TASK DESCRIPTION SHEET (continued)

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May set a kVp range button, if called for with equipment, corresponding to the appropriate kV range for the examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustments of table, tube height or position, and collimator.

d. Performer sets the focal-film distance. Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD (TFD) is obtained.

e. Performer provides everyone who will remain in room during exposure with protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

5. Performer prepares patient for the final position ordered for the first (or next) exposure:

a. Unless otherwise specified plans to make AP supine projection first and then lateral view.

b. Performer makes every effort to relieve any strain on patient. May explain or demonstrate to patient what is required. May obtain help in positioning. If patient is in labor, waits during contractions and proceeds when they subside.

List Elements Fully

c. For an AP projection (posterior view) of the gravid pelvis, performer helps the patient to lie in the supine position.

i) Centers the median sagittal plane of the body to the midline of table.

ii) Has patient flex knees and place feet flat on table. Immobilizes feet. May drape the patient's vaginal area with sterile towel. Has patient separate thighs. Has patient place arms in comfortable position such as with hands on chest.

iii) Places the Colcher-Sussman pelvimeter between patient's thighs with transverse scale against the buttocks at the level of the ischial tuberosities. Palpates through median part of buttocks or places ruler 10 cm. below the upper border of the symphysis pubis. Secures pelvimeter in place.

iv) Centers film about 1.5 inches above the symphysis pubis with lower border of cassette about four inches below the level of the transverse scale.

v) Directs central ray at right angles to the midpoint of the film.

d. For a lateral recumbent projection of the gravid pelvis, performer notes whether right or left lateral is requested. May adjust filter to correct position for side of interest.

i) Assists patient to lie on the side of interest so that the midaxillary line of the body is centered to the midline of the table.

TASK DESCRIPTION SHEET (continued)

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List Elements Fully

ii) Has patient hold legs together and flex knees about 90° and hips about 45°. May place supports between knees and ankles and immobilize legs. May support lower thorax so that long axis of lumbar vertebrae is parallel with tabletop. May have patient grasp side of table for support. Adjusts body in true lateral position by using calipers to check that the midgluteal and midlabial folds are same distance from the table.

iii) Turns pelvimeter scale lengthwise and adjusts height to the level of the median sagittal plane of patient's body. Places pelvimeter so that scale lies within upper part of gluteal fold and against the midsacrum. Checks that scale is parallel with long axis of femoral shaft.

iv) Centers film to the level of the most prominent point of the greater trochanter.

v) Directs central ray at right angles to midpoint of film.

e. For an erect lateral projection of the gravid pelvis, performer has patient stand in front of vertical bucky table in bare feet or slippers without heels. Notes whether right or left view is requested and has patient stand in lateral position with side of interest next to upright holder.

i) Has patient place hip on side of interest against vertical holder and distribute weight evenly. Has patient cross forearms over chest.

ii) Uses calipers to check that the midgluteal and midlabial folds are same distance from the table.

List Elements Fully

iii) Adjusts pelvimeter on non-skid stand so that the scale is at the level of the median sagittal plane of the patient's body and lying within the upper part of the gluteal fold and against the mid-sacrum, parallel with the long axis of the femoral shaft.

iv) Centers film to the level of the most prominent point of the greater trochanter.

v) Directs central ray horizontally at right angles to midpoint of film.

f. Performer applies compression band across hips if so ordered.

g. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. Adjusts the collimator so as to expose only the area of interest (and thus provide maximum protection and detail). If possible, attaches an auxiliary extension cone to collimate primary beam to the smallest size needed to cover the area of interest.

h. When everything is ready for the exposure, performer reminds patient of the cooperation and breath control to be used for exposure. Encourages patient to relax. Observes the patient's movement until the moment that the exposure is made. Readjusts posi-

TASK DESCRIPTION SHEET (continued)

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List Elements Fully

tion if warranted. Waits for any contraction to subside.

6. Performer returns to control room:

   a. Makes sure controls are properly set, and that patient is still in position.
   b. Asks patient to indicate when fetus is quiet. When this is done, asks patient to breathe deeply several times as rehearsed, and then to breathe in and hold or breathe out and hold without moving.
   c. Performer initiates exposure by pressing hand trigger or exposure control button.
   d. While exposure is underway, performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

      i) May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction may decide to report; anticipates need to repeat exposure.
      ii) With phototimer notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure.
      iii) After exposure is completed tells patient that she can breathe and relax.
      iv) If the exposure is terminated by a circuit breaker, rechecks technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.
      v) After exposure removes cassette and removes markers for further use.

List Elements Fully

   e. Performer takes second exposure as described above.

7. The performer arranges to have the films processed at once or decides to do personally.

   a. Attaches ID card for use with flasher if appropriate. May sign requisition.
   b. While the films are being processed and/or evaluated, performer has patient relax. Explains what will happen next. If appropriate, makes sure that patient will be attended while waiting.

8. Throughout procedure performer observes patient for any signs of emergency and/or to prevent or respond to an accident. Is alert to signs of onset of labor such as irregular contractions becoming regular, or rupture of "bag of waters."

   a. If the amniotic membranes rupture and there is a watery gush of fluid from the vagina, performer does not attempt to wipe away secretions from vagina unless sterile procedure can be followed. If patient is not in care of nurse, performer may proceed as follows:

      i) Reports at once to proper staff member.
      ii) Keeps patient lying down.
      iii) Places clean towel under buttocks to absorb moisture.
      iv) May check that fetal heart can be heard using stethoscope.

   b. If patient is not attended by nurse and contractions appear to be regular, performer proceeds quickly with examination. Encourages patient to relax with each contraction using abdominal or

TASK DESCRIPTION SHEET (continued)

Task Code No. 468

This is page 10 of 11 for this task.

List Elements Fully

quiet breathing with mouth closed. Encourages patient not to bear down or attempt to push.

c. If patient is accompanied by nursing staff, assists as appropriate unless told to terminate.

d. If patient shows any other emergency signs, loses consciousness, or has an accident, performer calls appropriate physician or staff member at once. May decide to provide emergency first aid as well.

9. Depending on institutional procedures, performer brings the processed radiographs directly to the physician in charge; places them on view boxes, and informs physician that the radiographs are ready; or awaits results of quality review and further orders.

a. Performer may present prior films and/or materials for use in pelvimetry calculations.

b. If the physician or a staff member indicates that there is any problem with the technical factors or the patient positioning, performer records or notes for any "retakes" ordered.

c. If performer is asked to repeat any exposures, makes sure that the additional exposure is warranted medically, since additional radiation will be incurred.

i) Notes whether need to repeat is due to performer's own negligence or lack of attention so that performer can avoid future "retakes."

ii) If request for retake reflects malfunctioning equipment, performer reports malfunction to appropriate staff member.

iii) If request for retake reflects the preference for density or

List Elements Fully

contrast of the physician, performer notes for future work done for the given physician so that retakes can be avoided.

d. Performer positions for further exposures as ordered as described above.

i) Repeats appropriate steps including identification of film holder or cassette and use of R-L marker, selection and setting of technique for next view (if different), and positioning equipment for focus-object-film alignment. Repeats breathing instructions, collimation, and makes further exposure(s) as described above.

ii) Has films processed and presented for review or takes to physician as they are processed. Continues as ordered until told that the radiography is completed.

iii) Performer refrains from commenting on the films to patient or providing any interpretation.

10. When performer is told that the examination has been completed, performer carries out termination steps for the examination:

a. Performer may assist patient from table. Makes sure patient is reminded of any footrest in stepping off table. Makes sure that none of the equipment is projecting over the patient before allowing patient to rise from table, and assists patient.

b. Performer may have patient transported to next assigned location, or decides to do personally, as

TASK DESCRIPTION SHEET (continued)

Task Code No. 468

This is page 11 of 11 for this task.

List Elements Fully	List Elements Fully
appropriate. If appropriate, makes sure that patient is in the care of staff person(s) who will transport to appropriate next location or, if out-patient, will arrange to discharge or send patient home, with escort if appropriate. c. Performer may have room and equipment cleaned; has secretions removed with disinfectant; may decide to do personally. Has any other appropriate clean up procedures followed to avoid infection or contamination, or decides to do personally, depending on institutional procedures. d. Performer records the examination according to institutional procedures. May include date, room, examination type, the overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each overhead view including retakes; may enter the estimated radiation dose to which patient and fetus were exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet. e. May present requisition form to physician for comments and signature. f. Performer may decide to jacket radiographs, requisition sheets, and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. g. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

TASK DESCRIPTION SHEET

Task Code No. 491

This is page 1 of 19 for this task.

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured;parts measured; films identified;technical factors selected and set; technique for magnification,bilateral filming,stereography set up;centering marks,shielding applied;pt. positioned,immobilized;exposures made;radiographs sent for processing and evaluation;procedures repeated as appropriate for full set of views;patient returned;examination recorded;radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, technical history,prior radiographs;pen;x-ray control panel,tube,bucky,table,collimator,extension cones;technique,standard view,tube rating,and rad exposure charts;cassettes,film holders;vertical cassette holder;shielding;R-L and ID markers;immobilization devices,head clamp,band,tape,gauze;calipers; stool;scissors;view boxes;emergency cart;sterile gloves,gown,mask;procedure tray;padding;diapers;pacifier;toys;protractor;triangles;wax marking pen;order forms;phone;stretcher

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Infant patient to be radiographed;co-worker;radiologist;nurse;accompanying adult

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking plain film radiographs of the skull of infant patient by reviewing request;reporting observed contraindications;reassuring pt.,adult;measuring part; setting up for magnification technique,bilateral exposures,stereography as ordered;selecting and setting technical factors;identifying film;applying localization marks;positioning pt. and equipment;immobilizing pt.;providing shielding;collimating;making exposure;having radiographs processed and reviewed; repeating for full set of views or as ordered;having pt. returned;placing radiographs for use;recording examination.

List Elements Fully

Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for an infant patient scheduled for radiography of the skull (cranium, facial bones, paranasal sinuses) as a result of:

- a. Regular assignment.
- b. Checking assignment on schedule sheet.
- c. Having arranged requisitions in order of priority.
- d. Receiving from co-worker.

The plain films of the skull may serve as preliminary "scout" films for contrast studies of the brain and other organs located in the skull,for more specialized procedures,and/or may be part of a survey series.

Depending on institutional arrangements, performer may also receive prior film(s) with record of technical factors used and/or any changes necessary.

1. Performer reads the requisition sheet to determine the examination called for, purpose, the patient involved, special considerations, and to check the completeness of the information provided:

   a. Performer checks the examinations called for, the areas and side(s) of in-

OK-RP;RR;RR

6. Check here if this is a master sheet..(x)

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terest, and the affected parts. Notes the name of the radiologist in charge; may note name of referring clinician.

b. Notes whether a bilateral study is indicated or, if unilateral, side of interest. Notes area(s) to be included in central ray. Notes positions and views called for, central beam angulation, any special requests. Notes whether magnification is ordered, whether there will be bilateral views on a single film.

c. Performer reads patient's name, identification number, sex, age, and weight. Notes whether patient is in-patient, out-patient, accident or emergency patient. Notes any special information that will affect patient positioning, technique, immobilization or handling of the patient, such as presence of accident injuries, unhealed or suspected fracture.

d. Performer checks whether patient is suffering from a collateral condition requiring special handling such as respiratory, heart disease, communicable or infectious condition, retardation; whether patient will be in incubator, has IV drip, oxygen supply, respiratory tube or similar device in place; notes whether patient will be accompanied by nurse, other staff person, parent or guardian. With patients with accident injuries or unhealed fractures, performer may make sure that a surgeon or radiologist is available to position the patient.

e. Performer checks prior preparation of patient:

   i) If patient's record indicates orders for sedation or any other prior medication, performer may check timing to be

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sure a proper elapse of time has occurred for medication to take effect. May arrange to delay examination if appropriate.

   ii) With patients who are to undergo subsequent contrast studies, performer may note whether orders for prior preparation have been given and carried out; if not already done, may arrange to have orders carried out or informs appropriate staff member.

   iii) May note patient's feeding schedule and arrange to have patient fed while in department if not contrary to needs of examination.

f. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition and the examination ordered. Plans to take special precautions with neonate or ill patient such as use of gown, mask, sanitary procedures to protect patient from contamination or to prevent spread of infection. Notes appropriate shielding for examination.

g. If performer is not already assigned to examination room (and a particular machine) notes the room or machine involved. Checks for grid or high speed bucky, if required for examination. If magnification has been requested, performer checks that the machine to be used has a fractional focal spot of appropriate size for direct magnification technique (i.e. 0.3 mm or smaller).

h. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

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  - i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention. May review prior films and consider whether any exposures ordered can be eliminated. Notes any record of technical factors used for prior films.
  - ii) If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

- i. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. When performer is clear about what will be involved in examination, he or she prepares ahead so as not to keep patient in examination room longer than necessary:

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- a. Performer washes hands as appropriate; depending on patient's condition, may decide to arrange for or carry out isolation or decontamination techniques.
- b. If appropriate, checks that procedure tray and emergency cart have been prepared or decides to do personally. Checks that clean pacifiers and toys are present.
- c. Checks that proper accessories for infant patient are available for procedure including leaded rubber shielding for patient, aprons and gloves to be used by anyone who will remain in the room during exposure, gown, mask for performer.
- d. Performer checks that appropriate immobilization devices for infant are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient.
- e. Makes sure that right (R) and left (L) markers are available for use and identification cards, leaded numerals or markers.
- f. Performer prepares for identification of the films using equipment provided by institution:

  - i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.
  - ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write or type out ID information on card if not received with requisition.
  - iii) Checks identification against requisition sheet.

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g. Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes for infants are available in the examination room. If not, arranges to obtain or decides to obtain personally.

h. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation for change in machine output or a policy decision).

i. Performer checks that x-ray equipment is ready for use. Goes to control panel and checks that indicator light shows that machine is "warmed up." If appropriate, performer may set radiography mode selector and set collimator control for manual operation.

j. Performer may set up equipment as appropriate for stereographic projections if ordered.

3. If magnification has been requested, performer prepares the equipment for the tube-over-table method of magnification (used without bucky):

   a. Performer determines the degree of magnification requested on the requisition sheet; if the request is expressed as an area magnification performer determines the linear magnification by taking the square root.

   b. Performer calculates the required distances from target (focal spot) to object (patient) (TOD), and from object to film (OFD), as well as the distance from target to film (TFD) (the sum of TOD and OFD):

      i) If the distance from the table top to a cassette placed on the floor or a stool (OFD) will be a relatively inflexible distance, performer measures this distance or reads indicator scale. (If stool is to be used, may note the table height.) Performer may adjust table height to provide for a round number for the OFD.

      ii) If the distance from the focal spot to the table top (TOD) will be the relatively inflexible distance, performer determines what this is by measuring or reading appropriate indicator scale on tube housing. Performer may adjust tube height to provide a round number for the TOD.

      iii) Depending on whether the OFD or the TOD is fixed, performer calculates the required complementary distance by referring to a magnification chart for the degree of linear magnification required, or uses the formula: degree of linear magnification equals TFD divided by TOD. For a two-times linear magnification performer simply sets the TOD equal to the OFD.

      iv) Performer adjusts and locks the table height and/or the tube height to the calculated OFD and TOD.

   c. Performer aligns the object-film and target-object distances:

      i) Performer moves the x-ray tube housing until it is centered over the table top in the approximate area where the patient's area of interest will be positioned on table.

      ii) Performer swings the table out of the way so that there is no obstruction between the tube and the floor. (Does not change

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height.) If appropriate, places a stool on the floor under the tube. May place cassette of appropriate size on floor or stool. Performer selects the size film designated for the degree of magnification and the selected part to be studied.

iii) Performer adjusts the collimation to correspond to the field size anticipated (for the TOD involved).

iv) Performer activates the light in the collimator and adjusts the tube horizontally so that the light beam cast is centered to the cassette on the stool or floor. Uses the cross-hairs projected by the beam to center the tube to the area on the floor or stool.

v) Performer locks the tube into position so that there is a 90° angle of the beam with the floor or stool. Fixes and retains collimator setting.

vi) Performer marks the outline of the collimated light area or cassette on the floor or stool using tape or other removable marker. If not already done, checks by placing cassette in marked area. May mark center of area as shown by cross-hairs.

vii) Performer swings table back into place. Activates light beam in collimator and marks the table top where the center cross-hairs and light outline are projected (to be used to center the part to be radiographed). Uses tape or other radiolucent removable marker.

viii) Performer may recheck TOD and OFD to be sure that they correspond to the calculated distances.

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d. For magnification technique using a vertical film holder, adjusts upright holder to appropriate height; adjusts x-ray tube to right-angle horizontal projection of beam to film holder; centers to the film; measures and adjusts TOD to expected patient's position and marks location of position; measures and adjusts OFD from position as marked.

e. If the sum of the new TOD and OFD (TFD) is now different from the TFD used for non-magnification technique, performer may consult technique chart to note the factor to use for a compensatory change in mAs. May record for later use in setting exposure factors.

f. Performer may also note the change in kVp and mAs necessary to compensate for any change in collimation from non-magnification technique. Consults appropriate chart for conversion factors. May record.

4. Performer readies patient for the examination:

a. Performer washes hands as appropriate. Depending on patient's condition, may decide to carry out isolation or decontamination techniques. Dons gown and mask.

b. Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.

c. Performer greets patient and any accompanying staff person and/or parent or guardian and introduces

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self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

d. If not already done, performer places padding on x-ray table. May have patient moved to table.

   i) If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.
   ii) With suspected fractures or accident patient, may have surgeon or radiologist position the patient.
   iii) May have nurse carefully place patient in supine position on table, or lifts patient carefully, supporting infant's head, and places on table.
   iv) Makes sure patient is being attended and there is no danger patient will fall off table. Makes sure patient is never unattended.
   v) If not already done, has patient's clothing removed and has patient put in gown and kept warm as appropriate.

e. Depending on institutional arrangements and condition of patient, performer may indicate to parent or guardian that he or she must wait outside of examination room or that he or she may remain in room to help reassure patient.

   i) Performer may provide privacy while mother breast feeds infant

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or may provide bottle and have patient fed.
   ii) Answers parent's or guardian's questions honestly; attempts to reassure and develop confidence. Remains aware that patient and/or adult may be frightened and/or patient in pain. Performer explains to adult when asked medical questions that it is not appropriate for technologist to answer these; encourages adult to speak to physician.

f. Performer attempts to develop a warm interaction with patient so that infant remains calm during examination. May hold patient; may speak to patient in calm, gentle voice; may provide clean pacifier or toy.

   i) If patient is difficult to calm, performer may have parent who is present leave, or if parent has left, may try having parent help calm patient.
   ii) If patient continues to be unmanageable, performer may consider requesting that procedure be delayed until child is more quiet. May discuss possibility of sedation with radiologist. If ordered, arranges to have administered.

g. Performer questions parent, RN or MD present on what movement is possible to determine what positions are available for use.

   i) Performer notes whether patient can be examined in the standard positions called for with

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the skull projections ordered; if not, plans to substitute alternative positions to achieve the same skull projections.

- ii) If patient is an accident victim and arrives on stretcher or bed, performer plans to accommodate by positioning of film and x-ray tube with patient on stretcher and without rotating head or torso. If any manipulation of patient's head is required, performer has physician carry this out.
- iii) If patient has a life support system in place, such as incubator, respiration, cardiac or infusion equipment, makes sure that this is being monitored.
- iv) If there is a wet dressing, performer has it reinforced or decides to do personally.

h. Performer may measure the patient for the dimensions relevant for views ordered. May use centimeter calipers to measure the thickness of the part(s) to be radiographed in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors.

i. Performer provides patient and everyone who will remain in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

5. After making sure that patient is being attended, performer sets up equipment for the examination before positioning and immobilizing patient.

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a. Depending on whether a bucky or table top technique will be used and standard institutional practices, performer selects speed and type of film, grid, and cassette combination:

- i) Selects size based on the size of the patient's skull and whether bilateral views are to be exposed on a single film.
- ii) For magnification technique, performer selects the size film designated for the degree of magnification and the patient's size.
- iii) If requisition calls for a facial profile study of bony and soft tissue contours, performer prepares cassette for lateral view. Then prepares a second film of the same size encased in a seamless black-paper envelope or has this done. Places loaded envelope on top of cassette and secures. Plans to expose both films simultaneously using exposure factors for lateral facial bone technique.

b. Performer obtains the appropriate size loaded cassette for the first (or next) projection.

- i) May mark midpoint of (each) cassette (or each half of a cassette to be used for separate bilateral views). Uses radiolucent marker.
- ii) If bilateral exposures will be made separately on one film, performer mentally decides how these will be positioned so that the film need not be turned for viewing each image. Per-

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former uses leaded rubber sheets and masks the cassette completely except for the half to be exposed. Treats the half to be exposed from this point as though it were the actual film size.

iii) If bilateral views are to be projected on a single film for a stereoscopic examination, performer numbers or marks cassettes so that the order of their placement and exposure will be correct.

c. Performer attaches identification information to the cassette or table top:

- i) Places right or left marker on film holder or table-top as appropriate to the study and projection or depresses appropriate R or L button for automatic marking.
- ii) If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.
- iii) If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
- iv) Performer may place patient's card into card tray for equipment using automatic film marking device.

d. If cassette is to be used with bucky (under table top or in upright holder) performer may manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position

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or inserts cassette tray into bucky slot and centers.

e. If a bucky is not being used, performer places film holder in a position approximating final positioning.

- i) If magnification technique is to be used, performer places cassette in marked position on floor or stool.
- ii) If appropriate, performer may place cassette in upright holder at right angles to table top or in other position selected.
- iii) With accident patient, after localization has been established, performer may obtain assistance in lifting skull so that cassette can be placed under patient.

f. Performer selects the exposure factors for the first projection. May consult the technique chart posted for the machine:

- i) Locates the information needed for the body part and projection involved according to the thickness of the part and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed, focal spot size, FFD and use or nonuse of other accessories (such as screens, grids, bucky, etc.).
- ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for. Makes note of any difference between FFD for preoperative measurements and other purposes and uses relevant distance as appropriate.

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iii) Once the standard kVp, mA and time have been determined, performer notes whether any conversions are necessary to account for patient's age, condition, change in FFD, unavoidable movement by patient, preference of the radiologist involved, and any other conversion needed such as posted change. Performer looks up numerical conversion factors and calculates, or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.

iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

g. Performer sets exposure factors as selected:

i) Enters control room. Makes sure that indicator light shows that x-ray generator is ready for use. Makes sure that all circuits have been stabilized. Checks that controls are set for radiography mode.

ii) As appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

iii) For conventional exposure control, performer selects milliamperage and chooses selectors for the correct focal spot size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major kilovoltage and minor kilovoltage settings to produce the desired kVp.

iv) For automatic phototimed exposure control, performer selects and sets the category corresponding to the type of study and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming).
May select and set a kVp range button (if called for with equipment) corresponding to range for examination.
Sets a density selector corresponding to the usual (or special) requirements for the study.
Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustment of table and tube height, position, and collimator (unless these have already been set as with magnification technique or stereo filming).

vi) Performer may return to overhead unit and set the focal-film distance (if not already done, as with magnification technique). Operates controls or manually moves the x-ray

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tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD is obtained.

6. Performer prepares the patient in the position selected for the first (or next) exposure (unless this is done by physician):

   a. Performer may have patient's body immobilized with extremities at sides by mummying (wrapping), or decides to do personally. If performer asks co-worker or nurse to do, indicates at what level sheet should be wrapped.
   b. May explain or demonstrate to staff member what is required for immobilizing the patient.
   c. Performer may mark centering points on patient's head (as described below) and then tape the auricles of each ear forward with a narrow strip of adhesive tape. Makes sure that tape does not extend beyond the posterior junction of the auricle and the head.
   d. In positioning head, performer refers to standard reference lines. May use wax marker to draw in reference lines or points on skull, or visualizes mentally.

      i) Performer defines the median sagittal plane of the skull by referring to the sagittal line connecting nasion, acanthion and symphysis menti (mental point).
      ii) Performer marks or defines the orbitomeatal line for reference

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as that connecting the external auditory meatus and the outer canthus of the patient's eye.
      iii) Performer marks or defines the infraorbitomeatal line as that connecting the external auditory meatus and the infraorbital margin. May palpate to find infraorbital margin.
      iv) Performer marks or defines the acanthiomeatal line as that connecting the external auditory meatus and the acanthion.
      v) Performer defines the interpupillary line as the transverse line which connects the pupils of the eyes when the patient is looking straight ahead, with the nasion at its midpoint.
      vi) Performer defines the glabelloalveolar line as that connecting the most prominent point in the midsagittal plane between the eyebrows and the most prominent point in the midsagittal plane of the upper alveolus.
      vii) Performer immobilizes skull with a head clamp or a weighted band and rechecks angulation and position. Uses extension cone in direct contact with head when appropriate for immobilization (as well as for proper collimation). Rechecks positioning after immobilizing.

   e. Performer centers part and keeps the long axis of the part parallel to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part. With upright holder, adjusts height of holder to part and centers part to film.

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In setting the tube angulation, the performer measures the angles between the central ray and the reference lines on the patient's skull, such as the orbitomeatal or interpupillary lines. Checks skull rotation by measuring the angle between the horizontal plane or the vertical central ray and the median sagittal plane.

f. Unless stereo-filming is automatic, performer proceeds by centering and directing the central ray for stereographic examination. Performer centers and adjusts the central ray at the angle for a single plane study:

  i) For first exposure moves centering point the correct distance in the appropriate direction (such as lateralward or posterior); then increases or decreases the angle as appropriate.
  ii) For the second exposure, removes the first cassette and replaces with a second cassette and, starting from single plane angulation, shifts centering in the opposite direction and for the same distance; changes the angulation in the opposite direction (increases or decreases).
  iii) For bilateral studies on a single cassette, has the first cassette include both sides shifted in the same direction, and the second cassette include both sides shifted in the opposite direction, so that each cassette has bilateral views with a common shift direction. Performer makes a total of four exposures for each study.

g. If pre-operative measurements are to be taken from the radiographs,

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performer takes special precautions in measuring angulation. Uses triangles and protractors to check every angle or line placement.

h. In positioning and immobilizing patient performer places patient in supine or prone position as appropriate. Uses horizontal beam for lateral projections if skull cannot be rotated. Uses supine, brow-up position rather than PA projections in trauma cases.

7. Performer positions and immobilizes patient (or has this done) as follows:

  a. For studies of the cranium, performer notes whether stereoscopic views are requested. For trauma victims performer makes left and right laterals of the skull and an AP projection of the base of skull with patient on stretcher, with minimum movement of patient.

    i) For lateral projections of the cranium, performer places or maintains patient in supine or prone position. Uses supine position, vertical cassette holder and horizontal beam for skull that cannot be rotated. Uses bucky and vertical beam for skull that can be turned to each side.
    For vertical beam projection turns the side of the skull to be examined to the film holder and adjusts body as appropriate. Supports head and opposite side of body. For horizontal beam projection supports head so that the median sagittal plane is vertical. Adjusts cassette placed vertically so that

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it is in contact with head on side of interest. Supports.

Positions head so that a coronal plane just anterior to the external auditory meatus is centered to the midline of film.

Has the median sagittal plane of the head parallel with the plane of the film. Checks that the interpupillary line is at right angles to the plane of the film, using a right angled object or protractor.

Centers cassette at the level of the sella turcica (just above and just anterior to the external auditory meatuses).

Directs central ray to the sella turcica at right angles to film and/or parallel to the interpupillary line.

For stereographic views takes first exposure with tube shifted somewhat below centering point and second exposure with tube shifted above centering point. Retain same position for both stereo exposures.

Performer reverses positioning after first exposure, and sets up equipment for opposite-side lateral view.

ii) For a PA projection (anterior view) of the cranium, performer places patient in a prone PA position with thorax supported and elevated, feet supported, and head resting on forehead. If patient cannot be moved to a prone position, elevates supine patient on one side so that head is in lateral position, with shoulder and hip supported, and uses an upright cassette holder, or decides on use of AP projection instead.

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Adjusts head so that the median sagittal plane is centered to the midline and is at right angles to the plane of the film.

Adjusts orbitomeatal line so that it is at right angles to the plane of the film. Supports chin.

Centers film to the midpoint of the interpupillary line (nasion).

Performer directs the central ray to the center of the area of interest. Checks the angulation between the central ray and the orbitomeatal line rather than any external perpendicular line. For a general study, directs the central ray to the midpoint of the film or so as to exit at the nasion at 15° caudad.

iii) For an AP half-axial projection (posterior semiaxial view) of the cranium, performer places patient in a supine position. Adjusts patient's head with chin depressed so that its median sagittal plane is at right angles to midline of film and the orbitomeatal line is at right angles to the plane of the film.

Centers film near the level of the foramen magnum and includes the highest point of the cranial vertex. Directs the central ray as ordered, depending on the area of interest. Refers to angulation between central ray and the orbitomeatal line. For a general study directs the central ray through the foramen magnum at 30° caudad or at 37° caudad to the infraorbitomeatal line.

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b. For studies of the mastoid processes of the temporal bones, performer notes whether bilateral and/or stereographic views are requested. Reviews areas of interest. Marks patient and cassettes for centering as appropriate.
If request is for bilateral stereo exposures, performer makes posterior shift for exposures one and three on the same cassette, showing the two sides; makes the anterior shift for exposures two and four, on the second cassette, also representing the two sides. Increases central ray angulation by 3° for posterior shifts and decreases by 3° for the anterior shifts.

i) For centering mastoid processes, performer marks a point on either side of head. For lateral oblique projections, marks a point at the junction of the auricle and the head immediately behind each external auditory meatus. Uses marking pen or wax pencil. If not already done, tapes each auricle forward as described.
ii) For an AP half-axial projection (posterior semiaxial view) of the mastoids, performer positions patient as for cranium view, with central ray 30° caudad. Uses very narrow collimation to include the mastoid and external auditory meatuses area bilaterally.
iii) For a lateral oblique projection of the mastoids, positions patient in prone position as described earlier. Places cassette on a 15° block (or other angle specified) angled caudally, and adjusts and immobilizes under patient's cheek.

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Adjusts patient's head in lateral position on side of interest, centered to localization point, at center of unmasked half of film. Adjusts head so that median sagittal plane is parallel with the plane of the film, and the interpupillary line is at right angles with the plane of the film. Adjusts flexion so that the infraorbitomeatal line is parallel with the transverse axis of the film.
Directs central ray to the marked centering point. Supports patient's head with a webbing strap.
For opposite side view, performer reverses positioning after first exposure and sets up equipment.

c. For studies of the orbits and optic foramina, performer reviews the purpose of the examination, whether bilateral views are ordered, and marks cassette for centering if appropriate.

i) For a PA projection (anterior view) of the orbits, places patient in prone position with head on film holder, resting on chin and nose. Supports thorax. Centers film at the level of the center of the orbits. Adjusts head so that the median sagittal plane is at right angles with the plane of the film. Directs central ray at right angles to film through the mid-orbits. Immobilizes head.
ii) For a parieto-orbital projection (cross section view) of

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the optic foramen, performer plans for bilateral views on a single film. Places patient in a prone position, as described. Rests patient's head on the zygoma, nose and chin of the side of interest. Adjusts flexion so that the acanthiomeatal line is at right angles to the plane of the film, and the rotation so that the median sagittal plane of the head is at a 53° angle with the plane of the film. For oblique view turns head 30° from side of interest.
Centers the orbit on the side of interest to the midpoint of the unmasked half of the film. Directs the central ray at right angles to the midpoint of the film. After first exposure, performer reverses position of head and sets up similarly for exposure of opposite side.

d. For studies of the facial bones, notes whether stereographic views are ordered. If so, plans to employ longitudinal tube shifts.
For radiographic demonstration of blowout fractures performer makes views with patient in "Waters" PA (parietoacanthial) position. For trauma patients makes view with patient in parietoacanthial position and makes lateral views, adapting positioning so as to require no movement of the patient from the supine position.
If a profile study of bony and soft tissue contours has been ordered, uses double film set-up (film in envelope placed over loaded cassette).

i) For lateral projection of the facial bones, performer notes whether stereoscopic projections

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are ordered, bilateral views, and whether a facial profile showing the relationship of the bony and soft tissue contours is requested. Performer places patient in supine position and adjusts cassette in vertical holder, with x-ray tube set for horizontal filming across table.
Adjusts patient's head so that the median sagittal plane is parallel with plane of film. For facial profile has patient's head rest against film holder in lateral position after the two-film set-up has been put into place, with film in envelope holder on top of film in cassette. Centers zygoma to the midline at center of film. For facial profile centers canine fossa to midpoint. Adjusts flexion so that the infraorbitomeatal line is parallel with transverse axis of film, and rotation so that interpupillary line is at right angles to the plane of the film. Supports jaw. Directs central ray at right angles to the midpoint of the film. For stereography makes the appropriate longitudinal tube shift. If bilateral views have been ordered, performer sets up similarly for opposite side after first exposure on the side of interest.

ii) For parietoacanthial projection (oblique frontal view in "Waters" position) of the facial bones, performer places patient in a prone PA position or adjusts patient in supine position with x-ray tube under the stretcher, and adjusts the cassette holder so that film

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can be placed over the patient's face in a horizontal plane. Rests prone patient in PA position with tip of extended chin against film. For supine patient, supports shoulders and neck so that head drops naturally back, and lowers cassette so that it touches patient's chin. Centers median sagittal plane of head to midline of film. Adjusts flexion so that orbitomeatal line is at 40° angle with the plane of the film, and rotation so that median sagittal plane is at right angles with plane of film. Directs central ray at right angles to midpoint of film.

iii) For nasal bones uses stereo "Waters" position as described above, with facial tilt more exaggerated, and makes lateral projections as described above. May use nonscreen technique.

e. For studies of the mandible performer reviews purpose and areas of interest. Notes whether examination is to demonstrate mandibular fractures. Places patient in supine or prone position as appropriate. If bilateral views are called for, employs similar positioning for opposite side after first exposure.

When head is resting on affected part, does not apply pressure when immobilizing.

i) For lateral oblique views places prone patient on a cassette raised 15° to 20° at its lower end with pillows under the patient's chest. Centers film to area of interest. Directs central ray in the cephalad angle

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ordered to the center of the area of interest (each mandible or the temperomandibular joint). With patient in supine position where rotation is contraindicated, performer places cassette in vertical position on the side of interest, parallel with the median sagittal plane. Centers to the area of interest. Directs central ray horizontally at cephalad degree ordered.

ii) Makes PA or AP projections as for cranium with central ray directed at jaws.

iii) Makes projections of the temperomandibular joints in AP or PA position with central ray directed at the jaws, and lateral oblique projections as for lateral mastoids.

f. If performer is to make projections of the paranasal sinuses, uses PA and/or AP "Waters" projections and makes lateral projections with patient in supine cranial position, as described earlier, using a horizontal beam. Includes the frontal, antral and ethmoid sinuses in the central beam.

For PA projection, rests patient's head on the forehead and nose, adjusted so that median sagittal plane is at right angles to the plane of the film. Centers to the nasion. Adjusts flexion so that the orbitomeatal line is at right angles to plane of film. Directs central ray to center of area of interest at caudal angle ordered.

g. Performer immobilizes patient by use of head clamp. Places restraining bands as appropriate using additional strips of gauze and adhesive tape as appropriate. May

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use a clean diaper stretched diagonally across the table and over the patient's head for lateral projections. May position head between two large sponges. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration, and other vital functions.

h. Performer checks final positioning using triangles, protractor and light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size (or the size of the unshielded area of the film to be exposed). Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the patient to the x-ray field, or centers the part to the film holder and uses the collimator light to center the tube to the part. Rechecks angulation of head and central ray. Checks that the primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube position lengthwise or crosswise to provide better centering.

8. Performer provides for appropriate collimation and shielding:

a. Once the patient has been positioned and immobilized, performer adjusts the collimator. Collimates so that a small unexposed border will appear around the edge of the film, and collimates further so as to expose only the area of interest (and thus provide maximum protection and detail). May use extension cone (in direct contact with head when appropriate for immobilization) for proper collimation. Adjusts primary beam to minimum size needed to cover the part(s) of interest.

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b. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.

c. Makes sure that anyone holding the patient (if absolutely necessary) or remaining in room is supplied with lead gloves and apron and stays out of central beam as much as possible.

d. Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

9. Throughout procedure performer observes patient for any signs of emergency and/or to prevent or respond to an accident. Is alert to signs suggesting faintness, or any impairment in respiration.

a. Notifies nurse or physician at once if patient shows emergency signs.

b. Makes sure that life support functions are being monitored and patient is never left unattended. Is especially careful to prevent patient falling.

c. If, during positioning, patient shows signs of severe pain, performer may notify appropriate, nurse or physician at once and await orders; may decide on alternative positioning to avoid movement of the affected part.

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10. Performer makes first (or next) exposure:
    a. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.
    b. The performer returns to control room. Makes sure controls are properly set and patient is still in position.
    c. Performer observes patient's breathing and times exposure to the appropriate instant for the phase required. Starts exposure for deep inspiration at the peak elevation of inspiration. Starts exposure for expiration after phase has begun.
    d. Performer initiates exposure by pressing hand trigger or exposure control button.
        i) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.
        ii) May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
        iii) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cut-off, or overexposure due to faulty timer).
        iv) After exposure is completed tells any adult with infant that he or she can relax.

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        v) If the exposure is terminated by a circuit breaker, rechecks technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.
        vi) After exposure performer returns to patient. Removes cassette or film holder from table, floor or bucky. Removes any markers for further use.
        vii) Performer may plan to have each radiograph processed and examined after exposure so that radiologist can terminate when appropriate and avoid unnecessary exposures.
        viii) Performer may arrange to have the full set of processed radiographs reviewed by a radiologist so that any additional views required can be made at once.
        ix) Performer repeats radiography steps for all exposures ordered before review by radiologist, adjusting technical factors, tube, and position of table or film holder as appropriate to each view ordered.
        x) Performer arranges to have the first exposure(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.
        xi) While films are being processed, makes sure that patient is comfortable and attended by staff person, parent or self.

11. Performer has processed films reviewed as appropriate:

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a. If the first radiograph(s) are preliminary (scout) films, and/or are to be reviewed wet, or viewed as processed, performer brings the processed radiograph(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist that the radiographs are ready.

b. If the radiologist indicates that there is any problem with the technical factors, processing, or patient positioning, performer records or notes for later use in the examination and/or repeats preliminary radiography as ordered.

c. When (or if) performer learns from the radiologist the extent of the injury and/or whether further conventional views and/or positions can be undertaken, eliminated or altered, performer proceeds as appropriate according to instructions:

   i) For further exposures performer repeats appropriate steps for next view(s) including identification of film holder or cassette and use of R-L marker, selection and setting of technique for next view (if different), positioning patient and equipment for focus-object-film alignment, proper collimation, shielding, immobilization, and exposure, as described. For bilateral exposures on one film, keeps R-L reference constant; centers using the point marked earlier on the cassette.

   ii) Performer refrains from commenting to parent or guardian on the films or providing any interpretation.

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d. If performer is asked to repeat any exposures, makes sure that the additional exposures are warranted medically, since additional radiation will be incurred.

   i) Notes whether need to repeat is due to performer's own negligence or lack of attention so that performer can avoid future "retakes."

   ii) If request for retakes reflects malfunctioning equipment, performer reports malfunction to appropriate staff member.

   iii) If request for retakes reflects the preference for density or contrast of a radiologist, performer notes for future work done for the given radiologist so that retakes can be avoided.

e. If appropriate, performer notes radiologist's orders for additional studies such as contrast study, conventional or computerized transverse axial tomography.

12. When performer is sure that the examination has been completed, carries out termination steps for the examination:

a. Performer may have patient fed, transported back to room, to parent or guardian, or next location, or decides to do personally, as appropriate.

b. Performer has equipment and examination table cleaned after use or decides to do personally, depending on institutional arrangements.

c. Performer records the examination according to institutional proce-

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dures. May include date, room, examination type, the views taken, the technical factors used and film sizes; may record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. If any views called for in the initial request could not be obtained, performer may record reasons. Signs requisition sheet.

d. If appropriate has radiologist fill out and/or sign requisition sheet for current study and/or new orders.

e. If performer will only carry out preliminary "scout" filming, and another technologist will continue with examination, performer records the approved technical factors used for the scouts, and the accessories employed, or informs technologist who will continue. Performer gives the requisition sheet, name card, and any notes to technologist who will continue with procedure.

f. Performer may decide to jacket films, requisition sheets, and related materials and/or have information recorded in log book personally or have this done, depending on institutional procedures.

g. For profile study of relationship of bony and soft tissue contours of facial bones, performer obtains films after processing. Marks bone projection (film from cassette) to be used in preparing contact print for mask (as in subtraction technique), to be superimposed on soft tissue projection (film from envelope) for a composite print; marks soft tissue projection appropriately. May fill out order for preparation of composite print (same

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process as subtraction technique), and place with radiographs for processing by darkroom aide, or decides to do personally.

h. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured;parts measured; films identified;technical factors selected and set; technique for magnification set up;pt. positioned, immobilized;shielding applied;exposures made;radiographs sent for processing and evaluation;procedures repeated as appropriate for full set of views;patient returned;examination recorded;radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, technical history;prior radiographs;pen;x-ray control panel,tube,bucky,table,collimator,extension cones;technique,standard view,tube rating,and rad exposure charts;cassettes,film holders,vertical cassette holder;shielding;R-L and ID markers;immobilization devices,head clamp,band,tape,gauze;calipers; stool;scissors;view boxes;emergency cart;sterile gloves,gown,mask;procedure tray;padding;diapers; pacifier;toys;wax marking pen;order forms;phone; stretcher

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Infant patient to be radiographed;co-worker;radiologist;nurse;accompanying adult

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking plain film radiographs of vertebral column of infant patient by reviewing request;reporting observed contraindications;reassuring pt.,adult;measuring part;setting up for magnification technique;selecting and setting technical factors;identifying film; positioning pt. and equipment;immobilizing pt.;providing shielding;collimating;making exposure;having radiographs processed and reviewed;repeating for full set of views or as ordered;having pt. returned;placing radiographs for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card,and any appropriate medical-technical history for an infant patient scheduled for radiography of the vertebral column (cervical, thoracic and/or lumbar spine, sacrum, coccyx) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

The plain films of the spine may serve as preliminary "scout" films for contrast studies such as myelography, or may be part of survey series.

Depending on institutional arrangements, performer may also receive prior film(s) with record of technical factors used and/or any changes necessary.

1. Performer reads the requisition sheet to determine the examination called for, purpose, the patient involved, special considerations, and to check the completeness of the information provided:

    a. Performer checks the examinations called for, the parts involved,and the affected areas. Notes whether a scoliosis series

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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is ordered. Notes the name of the radiologist in charge; may note the name of referring clinician.

b. Notes whether a bilateral study is indicated or, if unilateral, side of interest. Notes area(s) to be included in central ray. Notes positions and views called for, central beam angulation, any special requests. Notes whether magnification is ordered, whether there will be bilateral views on a single film.

c. Performer reads patient's name, identification number, sex, age, and weight. Notes whether patient is in-patient, out-patient, accident or emergency patient. Notes any special information that will affect patient positioning, technique, immobilization, or handling of the patient, such as presence of accident injuries, unhealed or suspected fracture, bone infection. Notes purpose of study.

d. Performer checks whether patient is suffering from a collateral condition requiring special handling such as respiratory, heart disease, communicable or infectious condition, retardation; whether patient will be in incubator, has IV drip, oxygen supply, respiratory tube or similar device in place; notes whether patient will be accompanied by nurse, other staff person, parent or guardian. With patients with accident injuries or unhealed fractures, performer may make sure that a surgeon or radiologist is available to position the patient.

e. Performer checks prior preparation of patient:

   i) If patient's record indicates orders for sedation or any other prior medication, performer may check timing to be sure a proper elapse of time has occurred for medication to take effect. May arrange to delay examination if appropriate.

   ii) Performer may note whether orders for prior preparation have been given and carried out; if not already done, may arrange to have orders carried out or informs appropriate staff member.

   iii) May note patient's feeding schedule and arrange to have patient fed while in department if not contrary to needs of examination.

f. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, and the examination ordered. Plans to take special precautions with neonate or ill patient such as use of gown, mask, sanitary procedures to protect patient from contamination or to prevent spread of infection. Notes appropriate shielding for examination.

g. If performer is not already assigned to examination room (and a particular machine) notes the room or machine involved. Checks for grid or high speed bucky, if required for examination. If magnification has been requested, performer checks that the machine to be used has a fractional focal spot of appropriate size for direct magnification technique (i.e. 0.3 mm or smaller).

h. Performer makes sure that the request is properly authorized,

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that information on requisition sheet is complete:

i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention. May review prior films and consider whether any exposures ordered can be eliminated. Notes any record of technical factors used for prior films.

ii) If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

1. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. When performer is clear about what will be involved in examination, he or she prepares ahead so as not to keep patient in examination room longer than necessary:

   a. Performer washes hands as appropriate; depending on patient's condition, may decide to arrange for or carry out isolation or decontamination techniques.
   b If appropriate, checks that procedure tray and emergency cart have been prepared or decides to do personally. Checks that clean pacifiers and toys are present.
   c. Checks that proper accessories for infant patient are available for procedure including leaded rubber shielding for patient, aprons and gloves to be used by anyone who will remain in the room during exposure, gown, mask for performer.
   d. Performer checks that appropriate immobilization devices for infant are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient.
   e. Makes sure that right (R) and left (L) markers are available for use and identification cards, leaded numerals or markers.
   f. Performer prepares for identification of the films using equipment provided by institution:

      i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.
      ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write or

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type out ID information on card if not received with requisition.

iii) Checks identification against requisition sheet.

g. Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes for infants are available in the examination room. If not, arranges to obtain or decides to obtain personally.

h. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation for change in machine output or a policy decision).

i. Performer checks that the x-ray equipment is ready for use. Goes to the control panel and checks that the indicator light shows that the machine is "warmed up." If appropriate, performer may set the radiography mode selector, and may set the collimator control for manual operation.

3. If magnification has been requested, performer prepares the equipment for the tube-over-table method of magnification (used without bucky):

   a. Performer determines the degree of magnification requested on the requisition sheet; if the request is expressed as an area magnification, performer determines the linear magnification by taking the square root.

   b. Performer calculates the required distances from target (focal spot) to object (patient) (TOD), and from object to film (OFD), as well as the distance from target to film (TFD) (the sum of TOD and OFD):

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      i) If the distance from the table top to a cassette placed on the floor or a stool (OFD) will be a relatively inflexible distance, performer measures this distance or reads indicator scale. (If stool is to be used, may note the table height.) Performer may adjust table height to provide for a round number for the OFD.

      ii) If the distance from the focal spot to the table top (TOD) will be the relatively inflexible distance, performer determines what this is by measuring or reading appropriate indicator scale on tube housing. Performer may adjust tube height to provide a round number for the TOD.

      iii) Depending on whether the OFD or the TOD is fixed, performer calculates the required complementary distance by referring to a magnification chart for the degree of linear magnification required, or uses the formula: degree of linear magnification equals TFD divided by TOD. For a two-times linear magnification performer simply sets the TOD equal to the OFD.

      iv) Performer adjusts and locks the table height and/or the tube height to the calculated OFD and TOD.

   c. Performer aligns the object-film and target-object distances:

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- i) Performer moves the x-ray tube housing until it is centered over the table top in the approximate area where the patient's area of interest will be positioned on table.
- ii) Performer swings the table out of the way so that there is no obstruction between the tube and the floor. (Does not change height.) If appropriate, places a stool on the floor under the tube. May place cassette of appropriate size on floor or stool. Performer selects the size film designated for the degree of magnification and the selected part to be studied.
- iii) Performer adjusts the collimation to correspond to the field size anticipated (for the TOD involved).
- iv) Performer activates the light in the collimator and adjusts the tube horizontally so that the light beam cast is centered to the cassette on the stool or floor. Uses the cross-hairs projected by the beam to center the tube to the area on the floor or stool.
- v) Performer locks the tube into position so that there is a 90° angle of the beam with the floor or stool. Fixes and retains collimator setting.
- vi) Performer marks the outline of the collimated light area or cassette on the floor or stool using tape or other removable marker. If not already done, checks by placing cassette in marked area. May mark center of area as shown by cross-hairs.
- vii) Performer swings table back into place. Activates light beam in collimator and marks the table top where the center cross-hairs and light outline are projected (to be used to center the part to be radiographed). Uses tape or other radiolucent removable marker.
- viii) Performer may recheck TOD and OFD to be sure that they correspond to the calculated distances.

d. For magnification technique using a vertical film holder, adjusts upright holder to appropriate height; adjusts x-ray tube to right-angle horizontal projection of beam to film holder; centers to the film; measures and adjusts TOD to expected patient's position and marks location of position; measures and adjusts OFD from position as marked.

e. If the sum of the new TOD and OFD (TFD) is now different from the TFD used for non-magnification technique, performer may consult technique chart to note the factor to use for a compensatory change in mAs. May record for later use in setting exposure factors.

f. Performer may also note the change in kVp and mAs necessary to compensate for any change in collimation from non-magnification technique. Consults appropriate chart for conversion factors. May record.

4. Performer readies patient for the examination:

a. Performer washes hands as appropriate. Depending on patient's condition, may decide to carry out isolation or decontamination techniques. Dons gown and mask.

b. Performer has the patient brought from the holding area and pre-

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pared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.

c. Performer greets patient and any accompanying staff person and/or parent or guardian, and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

d. If not already done, performer places padding on x-ray table. May have patient moved to table.

  i) If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.

  ii) With suspected fractures or accident patient, may have surgeon or radiologist position the patient. May have patient remain on stretcher until injury has been localized.

  iii) May have nurse carefully place patient in supine position on table, or lifts patient carefully, supporting infant's head, and places on table.

  iv) Makes sure patient is being attended and there is no danger patient will fall off table. Makes sure patient is never unattended.

  v) If not already done, has patient's clothing removed and has patient put in gown and kept warm as appropriate.

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e. Depending on institutional arrangements and condition of patient, performer may indicate to parent or guardian that he or she must wait outside of examination room or that he or she may remain in room to help reassure patient.

  i) Performer may provide privacy while mother breast feeds infant or may provide bottle and have patient fed.

  ii) Answers parent's or guardian's questions honestly; attempts to reassure and develop confidence. Remains aware that patient and/or adult may be frightened and/or patient in pain. Performer explains to adult when asked medical questions that it is not appropriate for technologist to answer these; encourages adult to speak to physician.

f. Performer attempts to develop a warm interaction with patient so that infant remains calm during examination. May hold patient, may speak to patient in calm, gentle voice; may provide clean pacifier or toy.

  i) If patient is difficult to calm, performer may have parent who is present leave, or if parent has left, may try having parent help calm patient.

  ii) If patient continues to be unmanageable, performer may consider requesting that procedure be delayed until child is more quiet. May discuss possibility of sedation with

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radiologist. If ordered, arranges to have administered.

g. Performer questions parent, RN or MD present on what movement is possible to determine what positions are available for use.

   i) Performer notes whether patient can be examined in the standard positions called for with the projections ordered; if not, plans to substitute alternative positions.
   ii) If patient has had a severe injury to the spine, performer plans for radiographic positioning of film and x-ray tube with patient on stretcher and without axial views or rotation. If any manipulation of patient's head or spine is required, performer may have physician carry this out.
   iii) Notes whether patient has obvious curvature of the spine (scoliosis).
   iv) If patient has a life support system in place, such as incubator, respiration, cardiac or infusion equipment, makes sure that this is being monitored.
   v) If there is a wet dressing, performer has it reinforced or decides to do personally.

h. Performer may measure the patient for the dimensions relevant for views ordered. May use centimeter calipers to measure the thickness of the part(s) to be radiographed in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors.

i. Performer provides patient and everyone who will remain in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

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5. After making sure that patient is being attended, performer sets up equipment for the examination before positioning and immobilizing patient:

   a. Depending on whether a bucky or table top technique will be used and standard institutional practices, performer selects speed and type of film, grid, and cassette combination:

      i) Selects size of film based on patient's size and whether bilateral views are to be exposed on a single film.
      ii) For magnification technique, performer selects the size film designated for the degree of magnification and the patient's size

   b. Performer obtains the appropriate size loaded cassette for the first (or next) projection.

      i) May mark midpoint of (each) cassette (or each half of a cassette to be used for separate bilateral views). Uses radiolucent marker.
      ii) If bilateral exposures will be made separately on one film, performer mentally decides how these will be positioned so that the film need not be turned for viewing each image. Performer uses leaded rubber sheets and masks the cassette completely except for the half

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to be exposed. Treats the half to be exposed from this point as though it were the actual film size.

c. Performer attaches identification information to the cassette or table top:

  i) Places right or left marker on film holder or table top as appropriate to the study and projection, or depresses appropriate R or L button for automatic marking.
  ii) If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.
  iii) If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
  iv) Performer may place patient's card into card tray for equipment using automatic film marking device.

d. If cassette is to be used with bucky (under table top in upright holder) performer may manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

e. If a bucky is not being used, performer places film holder in a position approximating final positioning.

  i) If magnification technique is to be used, performer places

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cassette in marked position on floor or stool.
  ii) As appropriate, performer may place cassette in upright holder at right angles to table top or in other position selected.
  iii) With accident patient, after localization has been established, performer may obtain assistance in lifting any part under which a cassette must be placed while the injured part is supported.

f. Performer selects the exposure factors for the first (or next) projection. Performer may consult the technique chart posted for the machine:

  i) Performer locates the information needed for the body part and the projection involved, according to the thickness of the part and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed, focal spot size, focal-film distance and use or nonuse of other accessories (such as screens, grids, bucky, etc.).
  ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.
  iii) Once the standard kVp, mA and time have been determined, performer notes whether any conversions are necessary to account for patient's age, condition, change in FFD, unavoidable movement by patient, pref-

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erence of the radiologist involved, and any other conversion needed such as posted change. Performer looks up numerical conversion factors and calculates, or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.

iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

g. Performer sets exposure factors as selected:

i) Enters control room. Makes sure that indicator light shows that x-ray generator is ready for use. Makes sure that all circuits have been stabilized. Checks that controls are set for radiography mode.

ii) As appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

iii) For conventional exposure control, performer selects milliamperage and chooses selectors for the correct focal spot size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of

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major kilovoltage and minor kilovoltage settings to produce the desired kVp.

iv) For automatic phototimed exposure control, performer selects and sets the category corresponding to the type of study and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming).
May select and set a kVp range button (if called for with equipment) corresponding to range for examination.
Sets a density selector corresponding to the usual (or special) requirements for the study.
Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustment of table and tube height, position, and collimator (unless these have already been set as with magnification technique).

vi) Performer may return to overhead unit and set the focal-film distance (if not already done, as with magnification technique). Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD is obtained.

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6. Performer prepares the patient in the position selected for the first (or next) exposure (unless this is done by physician):

   a. May explain or demonstrate to staff member what is required for immobilizing. May obtain help or has MD position and immobilize in accident and fracture cases.
   b. In positioning and immobilizing patient, performer places patient in supine position unless otherwise requested (such as for bending views). Uses horizontal beam for lateral projections when patient is supine. In positioning head, performer refers to standard reference lines.
   c. Performer centers part and keeps the long axis of the part parallel to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part. With upright holder, adjusts height of holder to part and centers part to film.

7. Performer positions and immobilizes patient (or has this done) as follows:

   a. For studies of the neck and cervical spine, performer notes whether flexion and extension views are required in the lateral view, whether an AP open mouth view is ordered of atlas and axis, and side of interest for lateral films. Performer determines whether a severe injury of the cervical spine may be involved requiring non-manipulative positioning, and notes whether the patient is to be positioned by a physician. Arranges for the latter as appropriate.

      i) For conventional AP projection (posterior view) of cervical vertebrae, performer places patient in supine position with mid-sagittal plane of body centered to midline of table. Places arms down alongside body, with shoulders in a single transverse plane. May tape arms to the body at the elbows after pulling them down. Elevates chin so that edges of upper incisors and mastoid tips lie in same transverse plane. Performer may immobilize head with head clamp or webbing strap under chin. Centers cassette to level of fourth cervical vertebra and directs central ray at right angles to midpoint of film.
      ii) If there is a non-localized injury or unhealed fracture, performer may make AP projection of cervical vertebrae by having patient's head held to prevent it from turning, and, with head lifted, slipping the cassette into position. Performer positions x-ray tube to any angle specified.
      iii) For AP open-mouth projection (posterior open-mouth view) of the atlas and axis, performer places patient in supine position. Aligns mid-sagittal plane of skull to midline of table; pulls down arms and tapes to sides of body. Performer places the cassette under the patient's neck, centered to the median sagittal plane at the level of the second cervical segment. Places towel or pad to prevent cassette from slipping. Directs central ray so that it parallels a line from the edge of the upper gums to the mastoid tip, centered to the open mouth.

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May mark line using marking pen or wax pencil. Immobilizes head with head clamp. Plans to make exposure while the infant cries, with beam directed through the open mouth.

iv) For lateral projection of cervical vertebrae, performer adjusts cassette in vertical position, at right angles to table on side of interest, so that the lower portion is in contact with patient's shoulder. Centers to the fourth cervical vertebra and immobilizes patient.
May place wedge shaped pads or radiolucent sponges beneath neck and between head and cassette. Pulls down patient's arms and tapes to body. Directs central beam at right angles to film across table to midpoint of film holder.

v) For lateral flexion view of cervical spine, performer positions as iv, above, for side of interest, with median sagittal plane of head and neck parallel with the plane of film. Places pad under head, and lowers chin so that it touches anterior aspect of neck or as far as possible in flexion without forcing. Directs central beam at right angles as above.

vi) For lateral extension view of cervical spine, performer positions as iv, above, for side of interest, but places patient's neck in extended position over a 45° angle pad, or as ordered. Performer may secure head by looping tape under chin and securing to edge of table. Performer makes sure not to force the extension of the neck. Centers beam as above.

b. For studies of the thoracic and/or lumbar spine, performer may plan

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to take advantage of "heel effect." If so, places anode end of x-ray tube over the thorax and the cathode end over the abdomen when positioning central beam. For frontal films where there is known spinal curvature, places convex aspect of the curve towards the film and concave aspect of the curve towards the tube. If there is a tumor or tenderness on dorsal side of patient, elevates patient's body on soft cotton. Performer determines whether patient requires preliminary filming without being moved.

i) For AP projection (posterior view) of the thoraco-lumbar spine, performer positions patient so that median sagittal plane of body is centered at midline of table, and long axis of x-ray-tube is parallel to this line, with the anode at the head (thoracic) end of the patient, and the cathode on the feet (abdominal) end. Centers film to the midpoint of the area of interest. Pulls arms down and places alongside body. May tape arms into position. Adjusts head and spine to single median sagittal plane, centered to midline, with shoulders in a single transverse line. Directs central ray at right angles to midpoint of film. If the spine is not on a horizontal plane, directs central ray at right angles to its long axis, through the midpoint.

ii) For lateral projection of thoraco-lumbar spine, performer maintains patient in supine position. Positions grid cassette or cassette holder verti-

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cally next to stretcher or on table on side of interest; supports so that x-ray beam may be directed horizontally at right angles to film. Centers cassette to the mid-axillary line of the body at the level of the center of area of interest. Directs central ray at right angles to midpoint of film.

iii) For "bending films" for scoliosis series, performer works with co-worker or accompanying adult. Performer instructs the "assistant" or personally grasps the patient's hips and upper thighs while the other person places patient's elbows against side of head, turning patient to lateral position on the side of interest. At signal from performer, has the two bend the patient's trunk forward. Immobilizes patient using tape in this lateral, forward-bending position. Centers film in bucky to midpoint of thoraco-lumbar area. Directs central beam vertically at right angles to film directed to midpoint of film.

If appropriate, performer repeats positioning, this time moving patient's hips and thighs away from the arms and head, so that patient is in lateral backward bending position. Immobilizes with tape or bands. Centers beam and cassette as above to midpoint of area of interest, with central ray vertical at right angles to film.

c. Performer immobilizes patient as appropriate. Places restraining bands, strips of gauze, and adhesive tape as needed. May use head clamp;

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may use clean diaper stretched diagonally across the table and over the patient's head. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

d. If, during positioning, patient shows signs of pain, performer may notify appropriate physician or nurse at once and await orders; may decide on alternative positioning to avoid movement of the affected part.

e. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size (or the size of the unshielded area of the film to be exposed). Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the patient to the x-ray field, or centers the part to the film holder and uses the collimator light to center the tube to the part. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube position lengthwise or cross-wise to provide better centering.

8. Performer provides appropriate collimation and shielding:

a. Once the patient has been positioned and immobilized, performer adjusts the collimator so that a small unexposed border will appear around the edge of the film; colli-

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mates further so as to expose only the area of interest (and thus provide maximum protection and detail). For small fields performer attaches an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the part(s) of interest.

b. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.

c. Makes sure that anyone holding the patient (if absolutely necessary) or remaining in room is supplied with lead gloves and apron and stays out of central beam as much as possible.

d. Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

9. Throughout procedure performer observes patient for any signs of emergency and/or to prevent or respond to an accident. Is alert to signs suggesting faintness or any impairment in respiration.

   a. Notifies nurse or physician at once if patient shows emergency signs.

   b. Makes sure that life support functions are being monitored and patient is never left unattended. Is especially careful to prevent patient falling.

10. Performer makes first (or next) exposure:

   a. Observes the patient's movement until the moment that the exposure

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is made. Readjusts position if warranted.

b. The performer returns to control room. Makes sure controls are properly set and patient is still in position.

c. Performer observes patient's breathing, and times exposure to the appropriate instant for the phase required. For open mouth projection, waits until patient is crying and an instant when the mouth is wide open. Starts exposure for deep inspiration at the peak elevation of inspiration. Starts exposure for expiration after phase has begun.

d. Performer initiates exposure by pressing hand trigger or exposure control button.

   i) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

   ii) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.

   iii) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cut-off, or overexposure due to faulty timer).

   iv) After exposure is completed, tells any adult with infant that he or she can relax.

   v) If the exposure is terminated by a circuit breaker, rechecks

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technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.

vi) After exposure performer returns to patient. Removes cassette or film holder from table, floor or bucky. Removes any markers for further use.

vii) Performer may plan to have each radiograph processed and examined after exposure so that radiologist can terminate when appropriate and avoid unnecessary exposures.

viii) Performer may arrange to have the full set of processed radiographs reviewed by a radiologist so that any additional views required can be made at once.

ix) Performer repeats radiography steps for all exposures ordered before review by radiologist, adjusting technical factors, tube, and position of table or film holder as appropriate to each view ordered.

x) Performer arranges to have the first exposure(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

xi) While films are being processed, makes sure that patient is comfortable and attended by staff person, parent or self.

11. Performer has processed films reviewed as appropriate:

a. If the first radiograph(s) are preliminary (scout) films, and/or are to be reviewed wet, or viewed as processed, performer brings the processed radiograph(s) directly

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to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist that the radiographs are ready.

b. If the radiologist indicates that there is any problem with the technical factors, processing, or patient positioning, performer records or notes for later use in the examination, and/or repeats preliminary radiography as ordered.

c. When (or if) performer learns from the radiologist the extent of the injury and/or whether further conventional views and/or positions can be undertaken, eliminated, or altered, performer proceeds as appropriate according to instructions:

i) For further exposures performer repeats appropriate steps for next view(s) including identification of film holder or cassette and use of R-L marker, selection and setting of technique for next view (if different), positioning patient and equipment for focus-object-film alignment, proper collimation, shielding, immobilization, and exposure, as described. For bilateral exposures on one film, keeps R-L reference constant; centers using the point marked earlier on the cassette.

ii) Performer refrains from commenting to parent or guardian on the films or providing any interpretation.

d. If performer is asked to repeat any exposures, makes sure that the additional exposures are warranted

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medically, since additional radiation will be incurred.

  i) Notes whether need to repeat is due to performer's own negligence or lack of attention so that performer can avoid future "retakes."
  ii) If request for retakes reflects malfunctioning equipment, performer reports malfunction to appropriate staff member.
  iii) If request for retakes reflects the preference for density or contrast of a radiologist, performer notes for future work done for the given radiologist so that retakes can be avoided.

e. If appropriate, performer notes radiologist's orders for additional studies such as contrast study, conventional or computerized transverse axial tomography.

12. When performer is sure that the examination has been completed, carries out termination steps for the examination:

a. Performer may have patient fed, transported back to room, to parent or guardian, or next location, or decides to do personally, as appropriate.
b. Performer has equipment and examination table cleaned after use or decides to do personally, depending on institutional arrangements.
c. Performer records the examination according to institutional procedures. May include date, room, examination type, the views taken, the technical factors used and film sizes; may record the number of exposures made of each view including retakes; may enter the estimated

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radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. If any views called for in the initial request could not be obtained, performer may record reasons. Signs requisition sheet.
d. If appropriate, has radiologist fill out and/or sign requisition sheet for current study and/or new orders.
e. If performer will only carry out preliminary "scout" filming, and another technologist will continue with examination, performer records the approved technical factors used for the scouts, and the accessories employed, or informs technologist who will continue. Performer gives the requisition sheet, name card, and any notes to technologist who will continue with procedure.
f. Performer may decide to jacket films, requisition sheets, and related materials and/or have information recorded in log book personally, or have this done, depending on institutional procedures.
g. May indicate to appropriate staff person when the performer is ready to proceed with the next examination.

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured;parts measured; films identified;technical factors selected and set; technique for magnification set up;shielding applied; pt. positioned,immobilized;exposures made;radiographs sent for processing and evaluation;procedures repeated as appropriate for full set of views;patient returned;examination recorded;radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, technical history,prior radiographs;pen;x-ray control panel,tube,bucky,table,collimator,extension cones;technique,standard view,tube rating,and rad exposure charts;cassettes,nonscreen film holders; vertical cassette holder;shielding;R-L and ID markers;immobilization devices,translucent panels,bands, tape,gauze;calipers;stool;scissors;view boxes;emergency cart;sterile gloves,gown,mask;padding;diapers; pacifier;toys;wax marking pen;order forms;phone; stretcher

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Infant patient to be radiographed;co-worker;radiologist;nurse;accompanying adult

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking plain film radiographs of the upper extremities of infant patient by reviewing request;reporting observed contraindications;reassuring pt.,adult; measuring parts;setting up for magnification technique;selecting and setting technical factors;identifying film;positioning pt. and equipment;immobilizing pt.;providing shielding;collimating;making exposures;having radiographs processed and reviewed; repeating for full set of views or as ordered;having pt. returned;placing radiographs for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for an infant patient scheduled for radiography of the upper extremities (hand (s), wrist(s), forearm(s), elbow joint(s), upper arm(s), and/ or shoulder joint, clavicle and scapula) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s) with record of technical factors used and/or any changes necessary.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, and to check the completeness of the information provided:

   a. Performer checks the examination(s) called for, the part(s) involved, the extent of the area of interest, whether distal and/or proximal joint is to be included, the affected side, whether bilateral or unilateral studies are ordered. Notes the name of the radiolo-

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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gist in charge; may note name of referring clinician.

b. Performer notes the positions and views called for, the number of exposures, whether standard and/or special series, whether magnification is ordered, whether there will be multiple views on a single film. Notes orders on technique such as use of bucky, nonscreen holders.

c. Performer reads patient's name, identification number, sex, age, weight. Notes whether patient is in-patient, out-patient, or emergency patient. Notes any special information that will affect patient positioning, technique, immobilization, or handling of the patient, such as presence of suspected or unhealed fracture, presence of plaster cast, splints (to be left in place or removed by a physician), whether patient will be on a stretcher or in incubator.

d. Performer checks whether patient is suffering from a collateral condition requiring special handling such as respiratory or heart disease, communicable or infectious condition, retardation; notes whether patient has IV drip, oxygen supply, respiratory or similar devices in place; whether patient will be accompanied by nurse, other staff person, parent or guardian.

e. Performer checks prior preparation of patient:

   i) If patient's record indicates orders for sedation or any other prior medication, performer may check timing to be sure a proper elapse of time has occurred for medication to take effect. May arrange to delay examination if appropriate.

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   ii) May note patient's feeding schedule and arrange to have patient fed while in department if not contrary to needs of examination.

f. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, and the examination ordered. Plans to take special precautions with neonate or ill patient such as use of gown, mask, sanitary procedures to protect patient from contamination or to prevent spread of infection. Notes appropriate shielding for examination.

g. If performer is not already assigned to examination room (and a particular machine) notes the room or machine involved. Goes to examination room or control room for machine. Checks for grid or high speed bucky if required. If magnification has been requested, performer checks that the machine to be used has a fractional focal spot of appropriate size for direct magnification technique (i.e. 0.3 mm or smaller).

h. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

   i) Depending on institutional procedures performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in re-

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cent past, whether number of radiographic exposures ordered or done in past is extensive and should be brought to radiologist's attention.

- ii) May review prior films and consider whether any exposures ordered can be eliminated. Notes any record of technical factors used.
- iii) If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate and proceeds after obtaining needed information, signature, or orders.

i. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. When performer is clear about what will be involved in examination, he or she prepares ahead so as not to keep patient in examination room longer than necessary:

   a. Performer washes hands as appropriate; depending on patient's condition, may decide to arrange for or carry out isolation or decontamination techniques.
   b. If appropriate, checks that emergency cart has been prepared or is available, or decides to do personally. Checks that clean pacifiers and toys are present.
   c. Checks that proper accessories for infant patient are available for procedure including leaded rubber shielding for patient, aprons and gloves to be used by anyone who will remain in the room during exposure, gown, mask for performer.
   d. Performer checks that appropriate immobilization devices for infant are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient.
   e. Makes sure that right (R) and left (L) markers are available for use and identification cards, leaded numerals or markers.
   f. Performer prepares for identification of the films using equipment provided by institution:

      i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.
      ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write or type out ID information on card if not received with requisition.
      iii) Checks identification against requisition sheet.

   g. Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes for infants are available in the examination room. If not, arranges to obtain or decides to obtain personally.

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h. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation for change in machine output or a policy decision).

i. Performer checks that x-ray equipment is ready for use. Goes to control panel and checks that indicator light shows that machine is "warmed up." If appropriate, performer may set radiography mode selector and set collimator control for manual operation.

3. If magnification has been requested, performer prepares the equipment for the tube-over-table method of magnification (used without bucky):

   a. Performer determines the degree of magnification requested on the requisition sheet; if the request is expressed as an area magnification performer determines the linear magnification by taking the square root.

   b. Performer calculates the required distances from target (focal spot) to object (patient) (TOD), and from object to film (OFD), as well as the distance from target to film (TFD) (the sum of TOD and OFD):

      i) If the distance from the table top to a cassette placed on the floor or a stool (OFD) will be a relatively inflexible distance, performer measures this distance or reads indicator scale. (If stool is to be used, may note the table height.) Performer may adjust table height to provide for a round number for the OFD.

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      ii) If the distance from the focal spot to the table top (TOD) will be the relatively inflexible distance, performer determines what this is by measuring or reading appropriate indicator scale on tube housing. Performer may adjust tube height to provide a round number for the TOD.

      iii) Depending on whether the OFD or the TOD is fixed, performer calculates the required complementary distance by referring to a magnification chart for the degree of linear magnification required, or uses the formula: degree of linear magnification equals TFD divided by TOD. For a two-times linear magnification performer simply sets the TOD equal to the OFD.

      iv) Performer adjusts and locks the table height and/or the tube height to the calculated OFD and TOD.

   c. Performer aligns the object-film and target-object distances:

      i) Performer moves the x-ray tube housing until it is centered over the table top in the approximate area where the patient's area of interest will be positioned on table.

      ii) Performer swings the table out of the way so that there is no obstruction between the tube and the floor. (Does not change height.) If appropriate, places a stool on the floor under the tube. May place cassette of appropriate size on floor or stool. Performer selects the size film designated for the

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degree of magnification and the selected part to be studied.

iii) Performer adjusts the collimation to correspond to the field size anticipated (for the TOD involved).

iv) Performer activates the light in the collimator and adjusts the tube horizontally so that the light beam cast is centered to the cassette on the stool or floor. Uses the cross-hairs projected by the beam to center the tube to the area on the floor or stool.

v) Performer locks the tube into position so that there is a 90° angle of the beam with the floor or stool. Fixes and retains collimator setting.

vi) Performer marks the outline of the collimated light area or cassette on the floor or stool using tape or other removable marker. If not already done, checks by placing cassette in marked area. May mark center of area as shown by cross-hairs.

vii) Performer swings table back into place. Activates light beam in collimator and marks the table top where the center cross-hairs and light outline are projected (to be used to center the part to be radiographed). Uses tape or other radiolucent removable marker.

viii) Performer may recheck TOD and OFD to be sure that they correspond to the calculated distances.

d. For magnification technique using a vertical film holder, adjusts upright holder to appropriate height; adjusts x-ray tube to right-angle horizontal projection

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of beam to film holder; centers to the film; measures and adjusts TOD to expected patient's position and marks location of position; measures and adjusts OFD from position as marked.

e. If the sum of the new TOD and OFD (TFD) is now different from the TFD used for non-magnification technique, performer may consult technique chart to note the factor to use for a compensatory change in mAs. May record for later use in setting exposure factors.

f. Performer may also note the change in kVp and mAs necessary to compensate for any change in collimation from non-magnification technique. Consults appropriate chart for conversion factors. May record.

4. Performer readies patient for the examination:

a. Performer washes hands as appropriate. Depending on patient's condition, may decide to carry out isolation or decontamination techniques. Dons gown and mask.

b. Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.

c. Performer greets patient and any accompanying staff person and/or parent or guardian and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. Checks with accompany-

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ing staff member on any special precautions necessary during procedure.

d. If not already done, performer places padding on x-ray table. May have patient moved to table.

   i) If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.
   ii) May have nurse carefully place patient in supine position on table, or lifts patient carefully, supporting infant's head, and places on table.
   iii) Makes sure patient is being attended and there is no danger patient will fall off table. Makes sure patient is never unattended.
   iv) If not already done, has patient's clothing removed and has patient put in gown and kept warm as appropriate.

e. Depending on institutional arrangements and condition of patient, performer may indicate to parent or guardian that he or she must wait outside of examination room or that he or she may remain in room to help reassure patient.

   i) Performer may provide privacy while mother breast feeds infant or may provide bottle and have patient fed.
   ii) Answers parent's or guardian's questions honestly; attempts to reassure and develop confidence. Remains aware that patient and/or adult may be frightened and/or patient in pain. Performer explains to adult when asked medical questions that it is not appropriate for technologist to answer these; encourages adult to speak to physician.

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f. Performer attempts to develop a warm interaction with patient so that infant remains calm during examination. May hold patient; may speak to patient in calm, gentle voice; may provide clean pacifier or toy.

   i) If patient is difficult to calm, performer may have parent who is present leave, or if parent has left, may try having parent help calm patient.
   ii) If patient continues to be unmanageable, performer may consider requesting that procedure be delayed until child is more quiet. May discuss possibility of sedation with radiologist. If ordered, arranges to have sedation administered.

g. Performer questions parent, RN or MD present on what movement is possible in the affected limbs or shoulder to determine what positions are available for use.

   i) Performer notes whether patient can be examined in the standard positions called for with the projections ordered; if not, plans to substitute alternative positions.
   ii) If movement is limited or fracture is suspected, performer decides on x-ray tube and patient positions to accomplish the radiography with a minimum of movement of the patient. May

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decide to use upright film holder in appropriate positions with patient stationary to accomplish this.

- iii) If there is an injured arm to be radiographed performer removes sleeve from unaffected side before slipping sleeve off affected side. If patient is suffering from a fracture, performer has staff member in attendance remove the necessary clothing from the area. If there is a splint or cast on injured area to be removed, performer has removed by appropriate staff member; does not remove personally.
- iv) If there is a wet dressing involved, performer has it reinforced or decides to do personally.
- v) If patient has a life support system in place, such as incubator, respiration, cardiac or infusion equipment, makes sure that this is being monitored.

h. Performer measures the patient for the dimensions relevant for the views ordered. May use centimeter calipers to measure the thickness of the part(s) to be radiographed in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors.

i. Performer considers the number and types of projections ordered for the examination and the patient's condition. Performer may consider a change from standard projections to better accomplish the purpose of the examination, or deletion of a position. Depending on institutional arrangements, performer may obtain permission from appropriate radiologist or decides personally to alter the standard procedure within institutional guidelines.

j. Performer provides patient and everyone who will remain in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure. If a staff member or parent or guardian will be asked to assist in positioning, performer provides leaded gloves and apron.

5. After making sure that patient is being attended, performer sets up equipment for the examination before positioning and immobilizing patient:

   a. Depending on whether a bucky or table top technique will be used, whether nonscreen holders or cassettes, and standard institutional practices, performer selects speed and type of film, grid, and film holder combination:

      - i) Selects size of film based on patient's size, the area of interest, and whether multiple views are to be exposed on a single film.
      - ii) For magnification technique, performer selects the size of film designated for the degree of magnification, the patient's size and the area of interest.

   b. Performer obtains the appropriate size loaded cassette for the first (or next) projection.

      - i) May mark midpoint of (each) cassette (or each section of a

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cassette to be used for separate multiple views). Uses radiolucent marker.

ii) If several views will be taken on one film, performer mentally decides how these will be positioned so that the film need not be turned for viewing each image. Performer uses leaded rubber sheets and masks the film holder completely except for the area to be exposed. Performer treats the area to be exposed from this point as though it were the actual film size.

c. Performer attaches identification information to the cassette or table top:

i) Places right or left marker on film holder or table top as appropriate to the study and projection, or depresses appropriate R or L button for automatic marking.

ii) If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.

iii) If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.

iv) Performer may place patient's card into card tray for equipment using automatic film marking device.

d. If cassette is to be used with bucky (under table top or in upright holder) performer may manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back.

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Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

e. If a bucky is not being used, performer places film holder in a position approximating final positioning.

i) If magnification technique is to be used, performer places cassette in marked position on floor or stool.

ii) If appropriate, performer may place cassette in upright holder at right angles to table top or in other position selected.

iii) May place leaded rubber sheet under nonscreen film holder.

f. Performer selects the exposure factors for the first projection. May consult the technique chart posted for the machine:

i) Locates the information needed for the body part and projection involved according to the thickness of the part and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed, focal spot size, FFD and use or nonuse of other accessories (such as screens, grids, bucky, etc.).

ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.

iii) Once the standard kVp, mA and time have been determined, performer notes whether any conversions are necessary to account for patient's age, a path-

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ological condition, plaster cast, a change in FFD, the preference of the radiologist involved, and any other conversion needed such as with magnification technique or posted change. Performer looks up numerical conversion factors and calculates or uses conversion chart to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.

iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

g. Performer sets exposure factors as selected:

i) Enters control room. Makes sure that indicator light shows that x-ray generator is ready for use. Makes sure that all circuits have been stabilized. Checks that controls are set for radiography mode.

ii) As appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

iii) For conventional exposure control, performer selects milliamperage and chooses selectors for the correct focal spot size. Selects and sets the exposure time that will produce the mAs

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desired. Sets the kVp selected by choosing the combination of major kilovoltage and minor kilovoltage settings to produce the desired kVp.

iv) For automatic phototimed exposure control, performer selects and sets the category corresponding to the type of study and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming).
May select and set a kVp range button (if called for with the equipment) corresponding to range for examination.
Sets a density selector corresponding to the usual (or special) requirements for the study.
Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustment of table and tube height, position, and collimator (unless these have already been set as with magnification technique).

vi) Performer may return to overhead unit and set the focal-film distance (if not already done, as with magnification technique). Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube

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housing; adjusts up or down until the required FFD is obtained.

6. Performer prepares the patient in the position selected for the first (or next) exposure:

   a. May obtain help in positioning and immobilizing patient. May explain to staff member or accompanying adult what is required.
   b. Makes sure that correct side and part are being positioned. If so ordered, plans to film unaffected side for comparison. Makes comparison radiographs in same position as side of interest.
   c. In positioning and immobilizing injured patient, performer places patient in supine position. Uses horizontal beam when necessary to avoid rotating patient.
   d. Performer centers the part keeping the long axis of the part parallel to the film holder. When using a bucky centers patient to midline. With film holder or cassette on table top, centers film to part. With upright holder adjusts height of holder to part and centers part to film.

7. Performer positions and immobilizes patient as follows:

   a. For studies of the hand and wrist, performer centers with reference to the distal ends and shafts of the metacarpal bones and/or with reference to the radial and ulnar styloid processes. Notes side of interest and whether comparison views are required. Places patient so that hand and wrist can be centered on the film holder on table top in comfortable position.

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i) If there is a suspected foreign body in the hand, performer determines the point of entry and tapes a small lead marker over the point. May take anterior and lateral views.
ii) If the wrist is in a cast or splint performer centers by comparing with opposite wrist in identical position.
iii) For anterior view (PA projection) of hand and/or wrist, centers to film holder or unmasked portion of holder with hand in prone position. Relaxes hand and separates patient's fingers. Immobilizes by placing translucent plastic panel, balsa board, or lucite paddle gently across hand and weighting each end to hold in place.
iv) For AP oblique view (PA oblique projection) of hand and/or wrist, rotates patient's hand externally to about 40° from prone position. May flex and separate fingers and extend thumb. Uses sponge or cotton for support and sandbags to hold in position.
v) For lateral view of hand and wrist, rotates wrist externally 90° from prone position. Extends patient's fingers and thumbs so that ulnar side of wrist is facing film holder. Checks that metacarpals and phalanges are superimposed. Uses sponges or blocks to support on either side.
vi) Directs central ray at right angles to film, entering at center of area of interest.

   b. For studies of the forearm and elbow, performer centers arm on film

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holder with reference to the radial and ulnar styloid processes and the lateral and medial epicondyles of the humerus. Notes side of interest and whether comparison views are required.

- i) Places patient in supine position on table with the arm abducted lateral to the body.
- ii) For a posterior view (AP projection) of forearm and elbow, extends patient's arm as much as possible with hand palm up (supinated). Checks that the anterior surface of the elbow is parallel to the plane of the film, and that the medial and lateral epicondyles of the humerus are parallel to the film holder. Immobilizes by placing translucent panel across arm; includes humerus and hand. Secures with sandbags.
- iii) For a lateral projection of forearm and elbow, maintains position and bends elbow to 90°, or as ordered, so that the forearm and hand are in true lateral position directed towards the head. Makes sure that the long axis of the forearm is parallel to the film, and that the radius, ulna and carpal bones are in lateral superimposition. Uses sponges to support in position, with plastic panel and sandbags to hold in place.
- iv) Directs central ray at right angles to film, entering at center of area of interest.

c. For the humerus, performer centers on table with reference to the lateral and medial epicondyles of the humerus and the acromion process of the scapula. Notes side of interest and whether a comparison view is required.

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- i) For a lateral projection of humerus, places patient in supine position on table with arm abducted. Flexes elbow 45° in direction of head so that thumb is against table. Checks that epicondyles are at right angles to the plane of the film. Centers film to area of interest. Uses sponges to support in position, with plastic panel and sandbags to hold in place.
- ii) Directs central ray at right angles to film, entering at center of area of interest; includes either joint as specified.

d. For the shoulder, performer notes the positions involved and whether bilateral PA views are required on one film. If so, places both arms in the same position.

- i) For the AP projection (posterior view) of the shoulders, performer places patient in supine position.
  If rotation is ordered, performer locates the epicondyles and holds between thumb and index finger of one hand while adjusting each arm. For external rotation turns palm(s) forward. Abducts arm(s) slightly so that the coronal plane of the epicondyles is parallel with plane of film. Supports as needed. For neutral rotation rests patient's palm(s) against thigh(s). May tape into position. Adjusts arm(s) so that the coronal plane of the

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epicondyles is perpendicular to the plane of the film. Centers film to midpoint of area of interest. Immobilizes as appropriate. May use web band. Directs central ray at right angles to midpoint between shoulders or at right angles to the coracoid process on the side of interest.

ii) For an axiolateral projection of the shoulder joint, performer maintains patient in supine position. Abducts arm on affected side at right angles to the body. Flexes elbow. Elevates patient's head and shoulders 2 to 3 inches and supports. Immobilizes hand and wrist in lateral position. Supports patient's hand. Turns patient's head away from affected side and immobilizes with band. Performer places cassette on edge above shoulder as close as possible to neck. Supports cassette or tapes into place at right angles to table top. Directs central ray horizontally through the axilla to the acromioclavicular articulation and towards the film.

e. Performer immobilizes patient as appropriate. May use plastic panel held in place by sandbags. May use restraining bands, tape, a clean diaper stretched diagonally across the table and over the patient's head. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration, and other vital functions.

f. If, during positioning, patient shows signs of pain, performer may notify appropriate physician or nurse at once and await orders, or may decide on alternative positioning to avoid movement of the affected part.

g. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size (or the size of the unshielded area of the film to be exposed). Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the patient to the x-ray field, or centers the part to the film holder, and uses the collimator light to center the tube to the part. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube position lengthwise or crosswise to provide better centering.

8. Performer provides appropriate collimation and shielding:

a. Once the patient has been positioned and immobilized, performer adjusts the collimator so that a small unexposed border will appear around the edge of the film; collimates further so as to expose only the area of interest (and thus provide maximum protection and detail). May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the part(s) of interest.

b. If not already done, performer applies appropriate lead shielding to gonads and other sensitive

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areas that may be in the primary beam but are not of interest for the examination.

c. Makes sure that anyone holding the patient (if absolutely necessary) or remaining in room is supplied with lead gloves and apron and stays out of central beam as much as possible.

d. Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

9. Throughout procedure performer observes patient for any signs of emergency and/or to prevent or respond to an accident. Is alert to signs suggesting faintness, or any impairment in respiration.

   a. Notifies nurse or physician at once if patient shows emergency signs.

   b. Makes sure that life support functions are being monitored and patient is never left unattended. Is especially careful to prevent patient falling.

10. Performer makes first (or next) exposure:

   a. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

   b. Performer returns to control room. Makes sure controls are properly set and patient is still in position.

   c. Performer observes patient's breathing and times exposure to the appropriate instant for the phase required. Starts exposure for deep inspiration at the peak elevation of inspiration. Starts exposure for expiration after phase has begun.

   d. Performer initiates exposure by pressing hand trigger or exposure control button.

      i) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

      ii) May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.

      iii) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cut-off, or overexposure due to faulty timer).

      iv) After exposure is completed tells any adult with infant that he or she can relax.

      v) If the exposure is terminated by a circuit breaker, rechecks technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.

      vi) Afer exposure performer returns to patient. Removes cassette or film holder from table, floor or bucky. Removes any markers for further use. If multiple views are to be made on the film, removes leaded rubber mask and remasks all but next area to be exposed.

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vii) If the patient is being examined for a possible fracture or if so requested, performer arranges to have the first exposure processed at once and brought to the appropriate radiologist.

viii) Performer may plan to have each radiograph processed and examined after exposure so that radiologist can terminate when appropriate and avoid unnecessary exposures.

ix) Performer repeats radiography steps for all exposures ordered before review by radiologist, adjusting technical factors, tube, and position of table or film holder as appropriate to each view ordered.

x) Performer may arrange to have the full set of processed radiographs reviewed by a radiologist so that any additional views required can be made at once.

xi) Performer arranges to have the exposure(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

xii) While films are being processed, makes sure that patient is comfortable and attended by staff person, parent or self.

11. Performer has processed films reviewed as appropriate:

a. If the first radiograph(s) are preliminary (scout) films, and/or are to be reviewed wet, or viewed as processed, performer brings the processed radiograph(s) directly to the radiologist in charge,places on view boxes, and/or arranges to have viewed in darkroom; informs

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radiologist that the radiographs are ready.

b. If the radiologist indicates that there is any problem with the technical factors, processing, or patient positioning, performer records or notes for later use in the examination and/or repeats preliminary radiography as ordered.

c. When (or if) performer learns from the radiologist the extent of the injury and/or whether further conventional views and/or positions can be undertaken, eliminated, or altered, performer proceeds as appropriate according to instructions:

i) For further exposures performer repeats appropriate steps for next view(s) including identification of film holder or cassette and use of R-L marker, selection and setting of technique for next view (if different), positioning patient and equipment for focus-object-film alignment, proper collimation, shielding, immobilization, and making exposure, as described. For multiple exposures on one film, keeps R-L reference constant; centers using the point marked earlier.

ii) Performer refrains from commenting to parent or guardian on the films or providing any interpretation.

d. If performer is asked to repeat any exposures, makes sure that the additional exposures are warranted medically, since additional radiation will be incurred.

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i) Notes whether need to repeat is due to performer's own negligence or lack of attention so that performer can avoid future "retakes." ii) If request for retakes reflects malfunctioning equipment, performer reports malfunction to appropriate staff member. iii) If request for retakes reflects the preference for density or contrast of a radiologist, performer notes for future work done for the given radiologist so that retakes can be avoided. 12. When performer is sure that the examination has been completed, carries out termination steps for the examination: a. Performer may have patient fed, transported back to room, to parent or guardian, or next location, or decides to do personally, as appropriate. b. Performer has equipment and examination table cleaned after use or decides to do personally, depending on institutional arrangements. c. Performer records the examination according to institutional procedures. May include date, room, examination type, the views taken, the technical factors used and film sizes; may record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. If any views called for in the initial request could not be obtained, performer may record reasons. Signs requisition sheet.	d. If appropriate has radiologist fill out and/or sign requisition sheet. e. Performer may decide to jacket films, requisition sheets, and related materials and/or have information recorded in log book personally or have this done, depending on institutional procedures. f. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

TASK DESCRIPTION SHEET

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This is page 1 of 18 for this task.

1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;portable or stationary x-ray equipment checked,cleaned,set up;pt. reassured;parts measured;films identified;technical factors selected and set;technique for magnification set up;barium fed and/or applied;isolation technique used;shielding applied;pt. positioned,immobilized;exposures made;radiographs sent for processing and evaluation; procedures repeated as appropriate for full set of views;patient returned;examination recorded;radiographs,portable equipment returned,placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, technical history,prior radiographs;pen;portable or stationary x-ray unit,control panel,tube,bucky,table, collimator,extension cones;footboard;technique,standard view,tube rating,rad exposure charts;cassettes; stool;scissors;view boxes;vertical cassette holder; shielding;R-L,ID markers;immobilization devices,head clamp,band,tape,gauze,pillowcase,stockinet;calipers; sterile gloves,gown,mask;procedure tray;padding;diapers;pacifier;toys;plastic wrap;barium paste,feeding bottle;marking pen;order forms;phone;incubator;soap; disinfectant solution;cleaning cloths;emergency cart

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(x) No...( )

4. **If "Yes" to q. 3:** Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Infant pt.;co-worker;radiologist;nurse;accompanying adult;neonate ward supervisor

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking radiographs of neck,chest of infant pt. by reviewing request;arranging transport,cleaning mobile unit;reporting observed contraindications;reassuring pt.,adult;measuring parts;setting for magnification; using isolation technique;selecting,setting technical factors;identifying film;positioning pt.;applying, feeding barium;immobilizing pt.;providing shielding; collimating;making exposures;having radiographs processed,reviewed;repeating,continuing as ordered;having pt.,equipment returned;recording exam;placing radiographs for use.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for an infant patient scheduled for radiography of the anterior portion of the neck (pharynx, larynx, upper end of esophagus) and/or the chest (ribs, thoracic viscera such as trachea, esophagus, heart,lungs, thymus, mediastinum) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

The plain films may be part of a survey and/or may serve as preliminary "scout" films for contrast studies or more specialized procedures. Requisition may require use of barium sulfate contrast medium.

Depending on institutional arrangements, performer may also receive prior film(s) with record of technical factors used and/or any changes necessary.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

OK-RP;RR;RR

6. Check here if this is a master sheet..(x)

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a. Performer checks the examination called for and the purpose, such as evaluation of heart size and/or functioning, heart or lung disease, respiratory obstruction or distress, pectus excavatum, pneumothorax, a check on positioning of endotracheal tube, etc. Notes the name of the radiologist in charge; may note name of referring clinician.

b. Performer reads patient's name, identification number, sex, age, height, weight. Notes whether patient is in-patient, out-patient, emergency patient.

c. If patient is neonate, notes whether patient is to be examined in neonate ward, and notes location if appropriate; checks the time for the scheduled procedure. If appropriate, notes whether bedside (portable) x-ray equipment must be provided, the name of staff person in charge in neonate ward.

d. Performer notes whether special and/or standard patient positions and projections are ordered, the side of interest, areas to be included in central beam, breathing instructions, whether inspiration-expiration films are ordered, central beam angulation, the nature of any foreign object to be localized, whether barium is to be administered by mouth (in bottle). Notes whether the use of a grid or bucky will be involved. Notes any request for magnification.

e. Notes any special information that will affect patient positioning, technique, immobilization or handling of the patient, such as presence of injuries, unhealed or suspected fracture, presence of endotracheal tube, IV drip, oxygen supply, incubator, or similar life support devices. Checks whether isolation technique is required for patient with communicable or infectious condition or if performer is to go to neonate ward. Notes whether patient will be accompanied by nurse, other staff person, parent or guardian.

f. Performer checks any orders for prior preparation of patient:

   i) If patient's record indicates orders for sedation or any other prior medication, performer may check timing to be sure a proper elapse of time has occurred for medication to take effect. May arrange to delay examination if appropriate.
   ii) With patient who is to undergo subsequent contrast study, performer may note whether orders for prior preparation have been given and carried out; if not already done, may arrange to have orders carried out or informs appropriate staff member.
   iii) May note patient's feeding schedule and arrange to have patient fed while in department if not contrary to needs of examination.

g. Performer considers the accessory equipment, technical factors, and immobilization equipment appropriate for the patient's age, sex, size, condition, and the examination ordered. Plans to take special precautions with neonate or ill patient such as use of gown, mask, isolation procedures to protect patient from contamination or to prevent spread of infection. Notes appropriate shielding for examination.

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h. If a portable machine is to be used, arranges to have it checked, cleaned and transported as appropriate, or decides to do personally.

i. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

   i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention. May review prior films and consider whether any exposures ordered can be eliminated. Notes any record of technical factors used for prior films.

   ii) If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

j. If referring physician has requested that films already on file be sent with current radiographs, and

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if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. When performer is clear about what will be involved in examination, he or she prepares ahead so as not to keep patient in examination room longer than necessary:

   a. If performer is not already assigned to examination room (and/or a particular machine) notes the room or machine involved.

      i) Checks for grid or high speed bucky as required for examination.

      ii) If magnification has been requested, performer checks that the machine to be used has a fractional focal spot of appropriate size for direct magnification technique (i.e. 0.3 mm or smaller).

      iii) For high kV technique checks that proper filter has been added to x-ray tube.

      iv) May check for delayed exposure switch.

   b. If performer is to carry out procedure with portable equipment in neonate ward, proceeds as follows:

      i) Performer checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and location.

      ii) Performer may report to the charge nurse or supervisor (with portable equipment if transported personally). Indicates name of patient and determines exact location for

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setting up equipment. Performer asks about specific precautions in dealing with patient. May record. Asks about any special equipment which must remain in place and be taken account of in setting up radiography unit. Washes hands before and after assembling materials following sanitary procedures.

iii) Performer makes sure that unit to be used has an adequate output for the required radiography and is hazard-proof. Checks for proper filter in x-ray beam, fractional focal spot size.

iv) If unit is battery operated checks that batteries are charged.

v) If not already done, performer prepares damp cloths with appropriate antiseptic and/or disinfectant solutions. Makes sure that unit is disconnected, and wipes equipment thoroughly to remove dirt, dust and lint.

vi) If not already done, performer assembles tube stand of unit and FFD measuring device as appropriate to equipment. Makes sure that line cord with grounding terminal and remote control delayed exposure cord are present and properly attached to unit.

vii) Performer may receive a clean hospital gown, cotton "boots," cap and mask from the charge nurse or neonate ward supervisor. Dons these before entering patient area. Carries out appropriate steps to maintain the sanitary integrity of the room.

viii) Performer positions portable apparatus next to incubator being careful not to disturb any equipment or electrical cords plugged in. Does not run over

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cords; lifts cords when possible or asks for assistance.

ix) Places machine so that x-ray tube can be directed vertically from above and horizontally across the incubator. Checks that tube can be adjusted to required distances (focal-object distance, FOD, and focal-film distance, FFD). Makes sure that performer will be able to stand behind shielding and away from x-ray beam during exposure.

x) Locks and/or uses brakes to immobilize portable equipment in place and moves overhead tube out of way until needed.

c. If examination is being done in x-ray department, washes hands as appropriate; depending on patient's condition, may carry out isolation or decontamination techniques.

d. If appropriate, checks that procedure tray and emergency cart have been prepared or decides to do personally. Checks that clean pacifiers and toys are present.

e. If barium mixture has been ordered, checks that a sterile nursing bottle and nipple with mixture has been ordered, prepared, and labeled, or arranges to order personally. When obtained, checks label to be sure proportions of the mixture are appropriate.

f. Checks that proper accessories for infant patient are available for procedure including leaded rubber shielding for patient, aprons and gloves to be used by anyone who will remain in the room during exposure, gown, mask for performer.

g. If infant is to be positioned for erect projections, performer sets up footboard at end of x-ray table to hold patient.

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h. Performer checks that appropriate immobilization devices for infant are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient.

i. Makes sure that right (R) and left (L) markers are available for use and identification cards, leaded numerals or markers.

j. Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes for infants are available in the examination room. If not, arranges to obtain or decides to obtain personally. May obtain transparent plastic wrap for cassettes to protect patient from contact with cassettes.

k. Performer prepares for identification of the films using equipment provided by institution:

  i) May obtain lead numerals and tape and prepare identification strip for placement on cassettes giving appropriate patient identification information.
  ii) Performer may prepare for use of flashcard by checking that there is piece of lead on cassette surfaces; may write or type out ID information on card if not received with requisition.
  iii) Checks identification against requisition sheet.

l. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation for change in machine output or a policy decision).

m. Performer checks that x-ray equipment is ready for use. Goes to control panel and checks that indicator light shows that machine is "warmed up." If appropriate, performer may set radiography mode selector and set collimator control for manual operation.

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3. If magnification has been requested, performer prepares the equipment for the tube-over-table method of magnification (used without bucky):

  a. Performer determines the degree of magnification requested on the requisition sheet; if the request is expressed as an area magnification performer determines the linear magnification by taking the square root.
  b. Performer calculates the required distances from target (focal spot) to object (patient) (TOD), and from object to film (OFD), as well as the distance from target to film (TFD) (the sum of TOD and OFD):

    i) If the distance from the table top to a cassette placed on the floor or a stool (OFD) will be a relatively inflexible distance, performer measures this distance or reads indicator scale. (If stool is to be used, may note the table height.) Performer may adjust table height to provide for a round number for the OFD.
    ii) If the distance from the focal spot to the table top (TOD) will be the relatively inflexible distance, performer determines what this is by measuring or reading appropriate indicator scale on tube housing. Performer may adjust tube height to provide a round number for the TOD.

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iii) Depending on whether the OFD or the TOD is fixed, performer calculates the required complementary distance by referring to a magnification chart for the degree of linear magnification required, or uses the formula: degree of linear magnification equals TFD divided by TOD. For a two-times linear magnification performer simply sets the TOD equal to the OFD.

iv) Performer adjusts and locks the table height and/or the tube height to the calculated OFD and TOD.

c. Performer aligns the object-film and target-object distances:

i) Performer moves the x-ray tube housing until it is centered over the table top in the approximate area where the patient's area of interest will be positioned on table.

ii) Performer swings the table out of the way so that there is no obstruction between the tube and the floor. (Does not change height.) If appropriate, places a stool on the floor under the tube. May place cassette of appropriate size on floor or stool. Performer uses the size film designated for the degree of magnification and the selected part to be studied.

iii) Performer adjusts the collimation to correspond to the field size anticipated (for the TOD involved).

iv) Performer activates the light in the collimator and adjusts the tube horizontally so that the light beam cast is centered to the cassette on the stool or

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floor. Uses the cross-hairs projected by the beam to center the tube to the area on the floor or stool.

v) Performer locks the tube into position so that there is a 90° angle of the beam with the floor or stool. Fixes and retains collimator setting.

vi) Performer marks the outline of the collimated light area or cassette on the floor or stool using tape or other removable marker. If not already done, checks by placing cassette in marked area. May mark center of area as shown by cross-hairs.

vii) Performer swings table back into place. Activates light beam in collimator and marks the table top where the center cross-hairs and light outline are projected (to be used to center the part to be radiographed). Uses tape or other radiolucent removable marker.

viii) Performer may recheck TOD and OFD to be sure that they correspond to the calculated distances.

d. For magnification technique using a vertical film holder, adjusts upright holder to appropriate height; adjusts x-ray tube to right-angle horizontal projection of beam to film holder; centers to the film; measures and adjusts TOD to expected patient's position and marks location of position; measures and adjusts OFD from position as marked.

e. If the sum of the new TOD and OFD (TFD) is now different from the TFD used for non-magnification technique, performer may consult

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technique chart to note the factor to use for a compensatory change in mAs. May record for later use in setting exposure factors.

f. Performer may also note the change in kVp and mAs necessary to compensate for any change in collimation from non-magnification technique. Consults appropriate chart for conversion factor. May record.

4. Performer readies patient for the examination:

   a. Performer washes hands as appropriate. May continue with isolation or decontamination technique. Dons gown, mask and gloves.

   b. If examination is being done in radiology department, performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.

      i) Performer greets patient and any accompanying staff person and/or parent or guardian, and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

      ii) If not already done, performer places padding on x-ray table. May have patient moved to table.

      iii) If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.

      iv) May have nurse carefully place patient in supine position on table, or lifts patient carefully, supporting infant's head, and places on table.

      v) Makes sure patient is being attended and there is no danger patient will fall off table. Makes sure patient is never unattended.

      vi) If not already done, has patient's clothing removed and has patient put in gown and kept warm as appropriate.

   c. Depending on institutional arrangements and condition of patient, performer may indicate to parent or guardian that he or she must wait outside of examination room or that he or she may remain in room to help reassure patient.

      i) Performer may provide privacy while mother breast feeds infant or may provide bottle and have patient fed.

      ii) Answers parent's or guardian's questions honestly; attempts to reassure and develop confidence. Remains aware that patient and/or adult may be frightened and/or patient in pain. Performer explains to adult when asked medical questions that it is not appropriate for technologist to answer these; encourages adult to speak to physician.

   d. Performer attempts to develop a warm interaction with patient so that infant remains calm during

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examination. May hold patient; may speak to patient in calm, gentle voice; may provide clean pacifier or toy.

i) If patient is difficult to calm, performer may have parent who is present leave, or if parent has left, may try having parent help calm patient.
ii) If patient continues to be unmanageable, performer may consider requesting that procedure be delayed until child is more quiet. May discuss possibility of sedation with radiologist. If ordered, arranges to have sedation administered.
iii) If inspiration-expiration radiographs are ordered, performer considers whether adequate films can be obtained. May discuss with radiologist; may receive orders on how to handle patient or for use of fluoroscopy by radiologist. Arranges to carry out any new orders as appropriate. Has radiologist record and sign requisition sheet if appropriate.

e. Performer questions parent, RN or MD present on what movement is possible to determine what positions are available for use. In neonate ward arranges to have RN position as indicated by performer.

i) Performer notes whether patient can be examined in the standard positions called for with the projections ordered; if not, plans to substitute alternative positions.
ii) If patient has a life support system in place, such as incubator, respiration, cardiac or

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infusion equipment, makes sure equipment is being monitored.
iii) If there is a wet dressing, performer has it reinforced or decides to do personally.

f. Performer may measure the patient for the dimensions relevant for views ordered. May use centimeter calipers to measure the thickness of the part(s) to be radiographed in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors.
g. Performer considers the number and types of projections ordered for the examination and the patient's condition. Performer may consider a change from standard projections to better accomplish the purpose of the examination, or deletion of a position or a change in technical factors. Depending on institutional arrangements, performer may obtain permission from appropriate radiologist or decides personally to alter the standard procedure within institutional guidelines.
h. Performer provides patient and everyone who will remain in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure. If a staff member, parent, or guardian will be asked to assist in positioning, performer provides leaded gloves and apron.

5. After making sure that patient is being attended, performer sets up

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equipment for the examination before positioning and immobilizing patient:

a. Depending on whether a bucky or table top technique will be used and standard institutional practices, performer selects speed and type of film, grid, and cassette combination:

  i) Selects size of film based on patient's size and whether bilateral views are to be exposed on a single film.
  ii) For magnification technique, performer selects the size film designated for the degree of magnification and the patient's size.

b. Performer obtains the appropriate size loaded cassette for the first (or next) projection.

  i) May mark midpoint of (each) cassette (or each half of a cassette to be used for separate bilateral views). Uses radiolucent marker.
  ii) If bilateral exposures will be made separately on one film, performer mentally decides how these will be positioned so that the film need not be turned for viewing each image. Performer uses leaded rubber sheets and masks the cassette completely except for the half to be exposed. Treats the half to be exposed from this point as though it were the actual film size.

c. Performer attaches identification information to the cassette or table top:

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  i) Places right or left marker on cassette or table top as appropriate to the study and projection or depresses appropriate R or L button for automatic marking.
  ii) If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.
  iii) If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
  iv) Performer may place patient's card into card tray for equipment using automatic film marking device.

d. Performer positions cassette:

  i) With neonate performer may wrap prepared cassette with plastic wrap before positioning cassette. Places wrapped cassette in incubator in location appropriate for filming (in preparation for placement of patient on cassette).
  ii) If a bucky is not being used, performer places film holder in a position approximating final positioning.
  iii) If magnification technique is to be used, performer places cassette in marked position on floor or stool.
  iv) As appropriate, performer may place cassette in vertical holder at right angles to table top.

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v) If cassette is to be used with bucky (under table top or in upright holder) performer may manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

e. Performer selects the exposure factors for the first or (next) projection. May consult the technique chart posted for the machine:

i) Locates the information needed for the body part and projection involved according to the thickness of the part and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed, focal spot size, FFD and use or nonuse of other accessories (such as screens, grid, bucky, etc.).

ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.

iii) Once the standard kVp, mA and time have been determined, performer notes whether any conversions are necessary to account for patient's age, condition, change in FFD, preference of the radiologist in charge, and any other conversion needed such as posted change. Performer looks up numerical conversion factors and calculates, or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time).

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Multiplies, divides, adds, or subtracts as appropriate.

iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

f. Performer sets exposure factors as selected:

i) Goes to control panel. Makes sure that indicator light shows that x-ray generator is ready for use. Makes sure that all circuits have been stabilized. Checks that controls are set for radiography mode.

ii) As appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

iii) For conventional exposure control, performer selects milliamperage and chooses selectors for the correct focal spot size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

iv) For automatic phototimed exposure control, performer selects and sets the category corresponding to the type of study and use or nonuse of

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screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming).

May select and set a kVp range button (if called for with equipment) corresponding to the range for the examination.

Sets a density selector corresponding to the usual (or special) requirements for the study.

Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustment of table and tube height, position, and collimator (unless these have already been set as with magnification technique).

vi) Performer may return to overhead unit and set the focal-film distance (if not already done, as with magnification technique). Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD is obtained.

6. Performer prepares the patient in the position selected for the first (or next) exposure unless this is done by nurse:

   a. Notes side of interest for lateral studies; notes phase of respiration ordered for exposures.

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   b. May explain or demonstrate to nurse what is required for immobilizing and positioning. May obtain help or help nurse.
   c. In positioning and immobilizing patient, places patient in supine and/or lateral recumbent position unless otherwise requested (such as for erect views). May plan to use horizontal beam for lateral projections with patient supine. In positioning head for AP projection performer keeps median sagittal plane vertical to avoid rotation of thorax.
   d. For inspiration-expiration views performer plans on AP and lateral filming, with two exposures for each type of view, one on inspiration and one on expiration. Exposes film on inspiration for first exposure; maintains patient in position; replaces film; exposes film on expiration for second exposure. Performer may make the two exposures on one film for comparison.
   e. Makes sure barium mixture in bottle (or paste for "funnel chest" study) is ready:
      i) For foreign body, heart series, or if otherwise specified, performer plans to feed patient barium mixture in nursing bottle just before films are to be exposed, waiting until patient has swallowed at least once. May plan to include nasopharynx in area of interest.
      ii) In "funnel chest" study performer plans to make AP projections and then trace the midline of the chest with barium paste before exposing lateral views.
   f. Performer centers part and keeps the long axis of the part parallel

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to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part. With upright holder, adjusts height of holder to part and centers part to film.

g. Performer arranges patient in position or indicates to nurse what to do as follows:

  i) Performer immobilizes patient's arms by extending them and placing them along sides of head, next to the ears.
  ii) May apply a sleeve made of a diaper, towel, pillowcase or orthopedic stockinet to hold arms in position. Puts this over arms so that sleeve holds arms above and behind head, one at each side.
  iii) May apply a sleeve of stretch gauze or bandage to the legs and pelvis. Wraps lightly to maintain patient in position.

h. In positioning and immobilizing patient, performer remains alert to patient's respiration. Does not force infant into a position where any breathing difficulty increases. Does not force flexion of the neck.

7. For studies of the neck and/or chest, performer positions and immobilizes patient (or has this done) as follows:

  a. For a supine AP projection (posterior view) of the infant chest and neck, performer centers infant in supine position on cassette or has this done.

    i) If high kV technique is being used only for AP projection, and if required, may insert appropriate additional filter in x-ray tube and remove after exposure.

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    ii) Has patient's arms immobilized above and behind head next to ears as described; has lower legs immobilized as described, or tapes legs together just above knees.
    iii) For neonate in incubator, has nurse place patient on cassette near one edge of incubator and immobilize arms over head with tape or bandage. Has pelvis immobilized with diaper pinned into place on either side.
    iv) If neck is to be included in area of interest, checks that neck can be extended and, if so, places pad under neck so that chin is extended.
    v) Performer adjusts patient so that median sagittal plane of body and head are centered to midline of cassette. Gently extends head and neck and immobilizes with head clamp, webbing strap under chin, or sponges so that median sagittal plane of head is at right angles to cassette. May elevate patient's knees and place restraining band across legs.
    vi) For lungs, directs central ray at right angles to film, centered to the sternal angle; for heart, centers to the midsternum.
    vii) If patient's neck cannot be extended, may direct central ray 5° to 10° cephalad.
    viii) For an "upshoot" film (simulated apical lordotic view), performer directs the central ray about 25° to 30° cephalad along the plane of the major fissure.
    ix) Performer may give child a clean pacifier and tape this into position unless this would impair respiration.

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x) For incubator directs central ray through plexiglass.

b. For upright AP projection (posterior view) of the infant chest and neck, performer immobilizes patient's upper and lower extremities as described above, and sets patient up against footboard of horizontal x-ray table; places cassette behind patient's back. Secures and immobilizes patient in upright seated position using restraining bands across head, pelvis, and legs. Directs central ray horizontally to midpoint of area of interest at right angles or at the cephalad angle indicated.

c. For a lateral projection of the infant chest and neck, performer notes side of interest and whether patient is to be positioned in a true lateral recumbent position or is to remain supine with tube directed horizontally across table to cassette placed vertically.

i) If high kV technique has been used for AP projection, may remove special filter for lateral projection.

ii) For "funnel chest" study, performer applies barium paste along the midline of the anterior surface of the chest.

iii) For lateral positioning, performer immobilizes patient's upper and lower extremities as described, and turns patient on to the side of interest or has this done. Cushions neck, chin, and head, and keeps cheek level with the cassette. Uses tape, restraining bands or diaper across table to support and hold patient in position. For lungs, directs central ray vertically at right angles to film, centered to the fourth thoracic vertebra; for heart centers to the sixth or seventh thoracic vertebra.

iv) For supine positioning for lateral projection, performer maintains patient in supine position as described on table or in incubator. May elevate on radiolucent sponge or pad. Positions grid cassette or grid holder vertically on table or against lateral wall of incubator on side of interest. Supports so that x-ray beam may be directed horizontally at right angles to film. May place wedge shaped pads or radiolucent sponges beneath neck; checks that head is in true AP position. Centers cassette to the mid-axillary line of the body at the level of the center of area of interest. Directs central ray at right angles to midpoint of area of interest. In directing x-ray beam through incubator on plexiglass side, is careful to avoid including ventilating holes and ports in the beam.

d. For oblique projection of the infant chest, performer notes whether left or right view is ordered. Positions patient from the AP supine position. Substitutes left AP oblique for right PA oblique projection, and right AP oblique for left PA oblique projection.

i) Performer elevates and supports the side opposite the side of interest on radio-

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lucent sponge blocks or towels so that the shoulder and chest on the side of interest are in contact with cassette at the angle indicated. Supports and immobilizes as described.

ii) Directs central ray at right angles to film through the center of area of interest such as at the level of the fourth thoracic vertebra.

e. For studies requiring oral ingestion of barium mixture, performer feeds patient with sterile bottle containing mixture or has this done. Observes patient until there is visible sign that patient has swallowed at least once.

f. If not yet completed, performer immobilizes patient in position. Places restraining bands, strips of gauze, and adhesive tape as needed. May use head clamp; may use clean diaper stretched diagonally across the table and over the patient's head. Avoids use of compression band across abdomen or chest. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

g. If, during positioning, patient shows signs of pain, performer may notify appropriate physician or nurse at once and await orders; may decide on alternative positioning to avoid movement of the affected part.

h. Performer checks final positioning by using light in collimator. Activates the collimator light; points the light beam towards the area of interest. Adjusts the collimator opening to correspond to the film

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size (or the size of the unshielded area of the film to be exposed). Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the patient to the x-ray field, or centers the part to the film holder and uses the collimator light to center the tube to the part. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube position lengthwise or cross-wise to provide better centering.

8. Performer provides appropriate collimation and shielding:

a. Once the patient has been positioned and immobilized, performer adjusts the collimator so that a small unexposed border will appear around the edge of the film; collimates further so as to expose only the area of interest (and thus provide maximum protection and detail). For small fields performer attaches an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the part(s) of interest.

b. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.

c. Makes sure that anyone holding the patient (if absolutely necessary) or remaining in room is supplied with lead gloves and apron and stays out of central beam as much as possible.

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d. Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

9. Performer observes patient's breathing, and plans exposure for the appropriate instant for the phase(s) required.

   a. For filming on full inspiration performer judges whether full inspiration is achieved with normal breathing or whether nurse should be asked to make patient cry. With patient crying or breathing normally, performer "breathes with" patient and notes pattern or when patient takes a deep breath, such as after a long cry. Plans to start exposure at the peak elevation of the chest just before the chest comes to rest at the end of an expansion.
   b. For filming on full expiration plans to start exposure after chest has begun to decline, timed so that exposure is made before inhalation begins.
   c. If, after observing and rehearsing with patient, performer considers that he or she cannot obtain full inspiration and/or expiration (i.e., if patient can only breathe shallowly, with inperceptable movements), reports to radiologist and awaits orders. May receive radiologist's orders to assist with fluoroscopic study; may provide requisition sheet for requesting or authorizing fluoroscopic examination.

10. Performer makes first (or next) exposure:

   a. Observes the patient's movement until the moment that the exposure

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is made. Readjusts position if warranted.

   b. The performer returns to control panel. Makes sure controls are properly set and patient is still in position. If appropriate; gives signal to nurse to make patient cry.
   c. If there is delay-exposure switch, starts rotor. Observes patient's breathing and times exposure to the appropriate instant for the phase required. Activates exposure for deep inspiration at the peak elevation of inspiration. Activates exposure for expiration after phase has begun.
   d. Performer initiates exposure by pressing hand trigger or exposure control button.

      i) While exposure is underway performer may check that mA meter records appropriate current as set, that kVp meter dips slightly.
      ii) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
      iii) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cut-off, or overexposure due to faulty timer).
      iv) After exposure is completed tells any adult with infant that he or she can relax.
      v) If the exposure is terminated by a circuit breaker, rechecks

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technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.

vi) After exposure performer returns to patient. Removes the cassette from the x-ray table, floor or bucky. Removes any markers for further use.

vii) For inspiration-expiration films, slips another cassette into position without disturbing patient's position; or removes leaded rubber mask and remasks all but next area to be exposed; and slips unmasked area into position. Then exposes next film at opposite phase of respiration.

viii) Performer repeats radiography steps for all exposures ordered before review by radiologist, adjusting technical factors, tube, and position of patient or cassette as appropriate to each view ordered.

ix) Performer may plan to have each radiograph processed and examined after exposure so that radiologist can terminate when appropriate and avoid unnecessary exposures.

x) Performer may arrange to have the full set of processed radiographs reviewed by radiologist so that any additional views required can be made at once.

e. Performer arranges to have the exposure(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

f. While films are being processed, makes sure that patient is comfortable and attended by staff person, parent or self.

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11. Throughout procedure performer observes patient for any signs of emergency and/or to prevent or respond to an accident. Is alert to signs suggesting faintness or any impairment in respiration.

a. Notifies nurse or physician at once if patient shows emergency signs.

b. Makes sure that life support functions are being monitored and patient is never left unattended. Is especially careful to prevent patient falling.

12. Performer has processed films reviewed as appropriate:

a. If the first radiograph(s) are preliminary (scout) films, and/or are to be reviewed wet, or viewed as processed, performer brings the processed radiograph(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist that the radiographs are ready.

b. If the radiologist indicates that there is any problem with the technical factors, processing, or patient positioning, performer records or notes for later use in the examination, and/or repeats preliminary radiography as ordered.

c. When (or if) performer learns from the radiologist whether further conventional views and/or positions can be undertaken, eliminated, or altered, performer proceeds as appropriate according to instructions:

i) For further exposures performer repeats appropriate steps for next view(s) including identi-

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fication of the cassette, use of R-L marker, the selection and setting of technique for next view (if different), positioning patient and equipment for focus-object-film alignment, proper collimation, shielding, immobilization, respiration phase, and making exposure, as described. For bilateral exposures on one film, keeps R-L reference constant; centers using the point marked earlier on the cassette.

ii) Performer refrains from commenting to parent or guardian on the films or providing any interpretation.

d. If performer is asked to repeat any exposures, makes sure that the additional exposures are warranted medically, since additional radiation will be incurred.

i) Notes whether need to repeat is due to performer's own carelessness or lack of attention so that performer can avoid future "retakes."

ii) If request for retakes reflects malfunctioning equipment, performer reports malfunction to appropriate staff member.

iii) If request for retakes reflects the preference for density or contrast of radiologist, performer notes for future work done for the given radiologist so that retakes can be avoided.

e. If appropriate, performer notes radiologist's orders for additional procedure such as contrast study, or fluoroscopy if adequate radiographs were not obtained.

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13. When performer is sure that the examination has been completed, carries out termination steps for the examination:

a. Performer may have patient fed, transported back to room, to parent or guardian, or next location, or decides to do personally, as appropriate.

b. Performer has equipment and examination table cleaned after use or decides to do personally, depending on institutional arrangements.

c. Performer records the examination according to institutional procedures. May include date, room, examination type, the views taken, the technical factors used and film sizes; may record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. If any views called for in the initial request could not be obtained, performer may record reasons. Signs requisition sheet.

d. If appropriate has radiologist fill out and/or sign requisition sheet for current study and/or new orders.

e. If performer will only carry out preliminary "scout" filming, and another co-worker will continue with examination, performer records the approved technical factors used for the scouts, and the accessories employed, or informs the co-worker who will continue. Performer gives the requisition sheet, name card, and any notes to

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the co-worker who will continue with procedure. f. Performer may decide to jacket films, requisition sheets, and related materials, and/or have information recorded in log book personally, or has this done, depending on institutional procedures. g. May report to supervisor or nurse in charge of neonate ward that radiography is completed. h. May decide to reassemble portable equipment and transport back to radiology department or has this done. i. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured;parts measured; films identified;technical factors selected and set; shielding applied;patient positioned,immobilized; barium fed to pt.;exposures made;radiographs sent for processing and evaluation;procedures repeated as appropriate for full set of views;patient returned; examination recorded;radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, technical history;prior radiographs;pen;x-ray unit, control panel,tube,bucky,table,collimator,extension cones;technique,standard view,tube rating,and rad exposure charts;cassettes,vertical cassette holder; shielding;R-L and ID markers;immobilization devices, head clamp,band,tape,gauze,pillowcase,stockinet;barium in feeding bottle;calipers;scissors;view boxes; emergency cart;sterile gloves,gown,mask;procedure tray;padding;diapers;pacifier;toys;wax marking pen; order forms;phone;stretcher;plastic wrap

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(x) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Infant patient to be radiographed;co-worker;radiologist;nurse;accompanying adult

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking plain film radiographs of abdomen of infant pt. by reviewing request;reporting observed contraindications;reassuring pt.,adult;measuring parts;following sanitary technique;selecting and setting technical factors;identifying film;positioning pt. and equipment;immobilizing pt.;providing shielding;collimating;feeding barium to pt.;making exposure;having radiographs processed and reviewed;repeating or continuing as ordered;having pt. returned;placing radiographs for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card,and any appropriate medical-technical history for an infant patient scheduled for radiography of the abdomen (including the gastrointestinal tract, liver, spleen, kidneys, bladder, diaphragm, abdominal aorta and intra-abdominal cavities) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

The plain films may be part of a series to locate a foreign body in the gastrointestinal tract, and/or may serve as preliminary "scout" films for contrast studies.

Depending on institutional arrangements, performer may also receive prior film(s) with record of technical factors used and/or any changes necessary.

1. Performer reads the requisition sheet to determine the examination called for, purpose, the patient involved, special considerations, and to check the completeness of the information provided:

   a. Performer checks the examinations called for and the purpose; notes whether

OK-RP;RR;RR

6. Check here if this is a master sheet..(x)

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air or fluid levels, foreign body, intestinal obstructions are to be examined and/or located.

b. Notes the name of the radiologist in charge; may note the name of referring clinician.

c. Performer reads patient's name, identification number, sex, age, and weight. Notes whether patient is in-patient, out-patient, accident or emergency patient.

d. Performer notes whether standard and/or special views are called for, the patient positions and projections, the number of exposures, the central beam angulation, the areas of interest and parts to be included. Notes whether a high speed bucky will be used.

e. For preliminary foreign body search, notes whether a single view is to include nasopharynx, neck, and trunk to anus, or whether separate exposures of each area are to be made. Notes suspected nature and location of the foreign body.

f. Notes any special information that will affect patient positioning, technique, immobilization, or handling of the patient, such as presence of acute abdominal signs, known pathologies, foreign body, presence of endotracheal tube, IV drip, oxygen supply, incubator, or similar life support devices. Checks whether isolation technique is required for patient with communicable or infectious condition or neonate. Notes whether patient will be accompanied by nurse, other staff person, parent or guardian.

g. If ingestion of barium has been ordered for foreign body search, may make sure that prior films have already been made without opaque medium.

h. Performer checks any orders for prior preparation of patient:

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i) If patient's record indicates orders for sedation or any other prior medication, performer may check timing to be sure a proper elapse of time has occurred for medication to take effect. May arrange to delay examination if appropriate.

ii) With patient who is to undergo subsequent contrast study, performer may note whether orders for prior preparation have been given and carried out; if not already done, may arrange to have orders carried out or informs appropriate staff member.

iii) May note patient's feeding schedule and arrange to have patient fed while [illegible] department if not contrary to needs of examination.

i. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, and the examination ordered. Plans to take special precautions with neonate or ill patient such as use of gown, gloves, mask, isolation procedures to protect patient from contamination or to prevent spread of infection. Notes appropriate shielding for examination.

j. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative

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exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention. May review prior films and consider whether any exposures ordered can be eliminated. Notes any record of technical factors used for prior films.

ii) If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

k. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. When performer is clear about what will be involved in examination, he or she prepares ahead so as not to keep patient in examination room longer than necessary:

a. If performer is not already assigned to examination room (and/or a particular machine) notes the room or machine involved. Checks for grid or high speed bucky.

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b. Performer washes hands as appropriate; depending on patient's condition, may arrange for or carry out isolation or decontamination techniques.

c. If appropriate, checks that procedure tray and emergency cart have been prepared or decides to do personally. Checks that clean pacifiers and toys are present.

d. If barium mixture has been ordered, checks that a sterile nursing bottle and nipple with mixture has been ordered, prepared, and labeled, or arranges to order personally. When obtained, checks label to be sure proportions of the mixture are appropriate.

e. Checks that proper accessories for infant patient are available for procedure including leaded rubber shielding for patient, aprons and gloves to be used by anyone who will remain in the room during exposure, gown, mask for performer.

f. Performer checks that appropriate immobilization devices for infant are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient. If erect position has been ordered, checks that there is radiolucent board available for positioning patient.

g. Makes sure that right (R) and left (L) markers are available for use and identification cards, leaded numerals or markers.

h. Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes for infants are available in the examination room. If not, arranges to obtain or decides to obtain personally. May use sta-

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tionary grid. May obtain transparent plastic wrap for cassettes to protect patient from contact with cassettes.

i. Performer prepares for identification of the films using equipment provided by institution:

   i) May obtain lead numerals and tape and prepare identification strip for placement on cassettes giving appropriate patient identification information.
   ii) Performer may prepare for use of flashcard by checking that there is piece of lead on cassette surfaces; may write or type out ID information on card if not received with requisition.
   iii) Checks identification against requisition sheet.

j. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation for change in machine output or a policy decision).

j. Performer checks that the x-ray equipment is ready for use. Goes to control panel and checks that indicator light shows that machine is "warmed up." If appropriate, performer may set radiography mode selector and may set collimator control for manual operation.

3. Performer readies patient for the examination:

a. Performer washes hands as appropriate. Depending on patient's condition, may decide to carry out isolation or decontamination techniques. Dons gown, mask, gloves.

b. Performer has the patient brought from the holding area and prepared

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for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.

c. Performer greets patient and any accompanying staff person and/or parent or guardian, and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

d. If not already done, performer places padding on x-ray table. May have patient moved to table.

   i) If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.
   ii) May have nurse carefully place patient in supine position on table, or lifts patient carefully, supporting infant's head, and places on table.
   iii) Makes sure patient is being attended and there is no danger patient will fall off table. Makes sure patient is never unattended.
   iv) If not already done, has patient's clothing removed and has patient put in gown and kept warm as appropriate.
   v) If foreign body is suspected but not yet localized, and if not already done, may have infant completely undressed; makes a check of garments to make sure that the object is not within or on garments.

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e. Depending on institutional arrangements and condition of patient, performer may indicate to parent or guardian that he or she must wait outside of examination room or that he or she may remain in room to help reassure patient.

   i) Performer may provide privacy while mother breast feeds infant or may provide bottle and have patient fed.
   ii) Answers parent's or guardian's questions honestly; attempts to reassure and develop confidence. Remains aware that patient and/or adult may be frightened and/or patient in pain. Performer explains to adult when asked medical questions that it is not appropriate for technologist to answer these; encourages adult to speak to physician.

f. Performer attempts to develop a warm interaction with patient so that infant remains calm during examination. May hold patient; may speak to patient in calm, gentle voice; may provide clean pacifier or toy.

   i) If patient is difficult to calm, performer may have parent who is present leave, or if parent has left, may try having parent help calm patient.
   ii) If patient continues to be unmanageable, performer may consider requesting that procedure be delayed until child is more quiet. May discuss possibility of sedation with radiologist. If ordered, arranges to have administered.

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g. Performer questions parent, RN or MD present on what movement is possible to determine what positions are available for use.

   i) Performer notes whether patient can be examined in the standard positions called for with the projections ordered; if not, plans to substitute alternative positions.
   ii) May note whether patient can be examined in erect position with use of radiolucent board under observation of co-worker or nurse. May plan for use of supine position followed by upright filming (if possible) or, if not possible, by patient in lateral decubitus position.
   iii) If patient is to be examined in the lateral decubitus or erect position, plans to have patient remain in that position for an appropriate amount of time before making the exposure(s) for fluid or gas levels to settle.
   iv) If patient has a life support system in place, such as incubator, respiration, cardiac or infusion equipment, makes sure equipment is being monitored.
   v) If there is a wet dressing, performer has it reinforced or decides to do personally.

h. Performer may measure the patient for the dimensions relevant for views ordered. May use centimeter calipers to measure the thickness of the part(s) to be radiographed in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors.

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- i. Performer considers the number and types of projections ordered for the examination and the patient's condition. Performer may consider a change from standard projections to better accomplish the purpose of the examination, or deletion of a position, or a change in technical factors. Depending on institutional arrangements, performer may obtain permission from appropriate radiologist or decides personally to alter the standard procedure within institutional guidelines.
- j. Performer provides patient and everyone who will remain in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure. If a staff member, parent, or guardian will be asked to assist in positioning, performer provides leaded gloves and apron.

4. After making sure that patient is being attended, performer sets up equipment for the examination before positioning and immobilizing patient:

   - a. Depending on whether a bucky or table top technique will be used and standard institutional practices, performer selects speed and type of film, grid, and cassette combination. Selects size of film based on patient's size and areas to be included in central beam.
   - b. Performer obtains the appropriate size loaded cassette for the first (or next) projection and attaches identification information to the cassette or table top:

     - i) Places right or left marker on cassette or table top as appropriate to the study and projection or depresses appropriate R or L button for automatic marking.
     - ii) If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.
     - iii) If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
     - iv) Performer may place patient's card into card tray for equipment using automatic film marking device.

   - c. Performer positions cassette:

     - i) With neonate performer may wrap prepared cassette with plastic wrap before positioning cassette. Places wrapped cassette in position appropriate for filming (in preparation for placement of patient on cassette).
     - ii) If a bucky is not being used, performer places cassette in a position approximating final positioning.
     - iii) As appropriate, performer may place cassette in vertical holder at right angles to table top; may use stationary grid.
     - iv) If cassette is to be used with bucky (under table top or in upright holder) performer may manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored"

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position or inserts cassette tray into bucky slot and centers.

d. Performer selects the exposure factors for the first or (next) projection. Consults the technique chart posted for the machine:

  i) Locates the information needed for the body part and projection involved according to the thickness of the part and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed, focal spot size, FFD and use or nonuse of other accessories (such as screens, grid, bucky, etc.).
  ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.
  iii) Once the standard kVp, mA and time have been determined, performer notes whether any conversions are necessary to account for patient's age, condition, change in FFD, preference of the radiologist in charge, and any other conversion needed such as posted change. Performer looks up numerical conversion factors and calculates, or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.
  iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

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e. Performer sets exposure factors as selected:

  i) Goes to control panel. Makes sure that indicator light shows that x-ray generator is ready for use. Makes sure that all circuits have been stabilized. Checks that controls are set for radiography mode.
  ii) As appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.
  iii) For conventional exposure control, performer selects milliamperage and chooses selectors for the correct focal spot size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.
  iv) For automatic phototimed exposure control, performer selects and sets the category corresponding to the type of study and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming).
  May select and set a kVp range button (if called for with equipment) corresponding to the range for the examination.

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Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made. v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustment of table and tube height position,and collimator (unless these have already been set). vi) Performer may return to overhead unit and set the focal-film distance (if not already done). Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD is obtained. 5. Performer prepares the patient in the position selected for the first (or next exposure: a. May explain or demonstrate to nurse what is required for immobilizing and positioning. May obtain help. b. Checks, if barium mixture is to be (or may be) administered, that bottle is ready. Performer plans to feed patient barium mixture in nursing bottle just before films are to be exposed, and wait until patient has swallowed at least once. Is careful to avoid spilling any media on patient's clothing or immobilization materials. c. In positioning and immobilizing patient, performer remains alert to patient's respiration. Does not force infant into position where any breathing difficulty increases. Does not force flexion of the neck.	i) Performer immobilizes patient's arms by extending them and placing them along sides of head, next to the ears. ii) May apply a sleeve made of a diaper, towel, pillowcase or orthopedic stockinet to hold arms so that sleeve holds arms above and behind head one at each side. iii) May apply a sleeve of stretch gauze or bandage to the legs and pelvis. Wraps lightly to maintain patient in position. d. In positioning and immobilizing patient, places patient in supine and/or lateral recumbent position unless otherwise requested (such as for erect view). Notes side of interest for lateral view. e. Performer centers part and keeps the long axis of the part parallel to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part. With upright holder, adjusts height of holder to part and centers part to film. f. In centering patient for view of abdominal contents performer includes the diaphragm at the upper border of the area of interest. Palpates for the costal angle just below the xiphoid process or palpates for the heartbeat over the apex of the heart. Includes the mid-symphysis pubis as the lower border of the area of interest. Palpates for the symphysis pubis. g. In centering patient for a preliminary radiopaque foreign body search film, performer includes the entire gastrointestinal tract from the external auditory meatuses to the level of the anal canal unless otherwise directed.

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6. For studies of the infant abdomen, performer positions and immobilizes patient (or has this done as follows):

   a. For a supine AP projection (posterior view) of the infant abdomen, performer centers infant in supine position on cassette or has this done.

      i) Has patient's arms immobilized above and behind head next to ears as described; has lower legs immobilized as described, or tapes legs together just above knees.

      ii) Performer adjusts patient so that median sagittal plane of body and head are centered to midline of cassette. May turn head to one side. Gently extends head and neck and immobilizes with head clamp, webbing strap under chin, or sponges so that median sagittal plane of head is at right angles or parallel to cassette. May elevate patient's knees and place restraining band across legs.

      iii) Centers film to area of interest as described. Directs central ray at right angles to the midpoint of film.

      iv) Performer may give child a clean pacifier and tape this into position unless this would impair respiration.

   b. For lateral recumbent (decubitus) projections of the infant abdomen, notes side of interest and whether patient is to be positioned in a true lateral recumbent position or is to remain supine with tube directed horizontally across table to cassette placed vertically.

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      i) For a lateral recumbent projection, performer immobilizes patient's upper and lower extremities as described, and turns patient on to the side of interest or has this done. Cushions neck, chin, and head, and keeps cheek level with the cassette. Uses tape, restraining bands or diaper across table to support and hold patient in position. Centers cassette in bucky (or on table under patient) to the area of interest. Directs central ray vertically at right angles to film.

      ii) For lateral recumbent positioning in lieu of AP erect projection, performer positions as described in (i), above. Centers cassette in upright holder behind patient. Directs central ray horizontally at right angles to the midpoint of film through the median line of body. For air or fluid levels maintains patient in position long enough before exposure for air or fluid levels to be accurately demonstrated.

      iii) For supine positioning for a lateral projection, performer maintains patient in supine position as described. May elevate on radiolucent sponge or pad. Positions vertical holder on appropriate side or positions grid cassette vertically on table. Supports so that x-ray beam may be directed horizontally at right angles to film. May place wedge shaped pads or radiolucent sponges beneath neck; checks that head is in true AP position. Centers cassette to the mid-axillary

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line of the body at the level of the center of the area of interest. Directs central ray at right angles to film, centered to the area of interest.

c. For upright AP projection (posterior view) of the infant abdomen, performer immobilizes patient's upper and lower extremities as described above.

   i) Aligns patient on radiolucent board and secures in true AP position.
   ii) Checks that patient is securely attached to board.
   iii) Props or positions board in upright position and has co-worker remain with patient to be sure board or patient does not fall.
   iv) Centers cassette in upright holder or vertical bucky to area of interest, and directs central ray horizontally to midpoint of film through the median line of body.
   v) Maintains patient in position long enough before exposure for air or fluid levels to be accurately demonstrated.

d. For a prone PA projection (posterior view) of the infant abdomen, performer immobilizes extremities as described.

   i) Places patient in prone position on cassette or table. Supports thorax and feet. Cushions and rests head on forehead or cheek.
   ii) Centers cassette and directs central beam as described for AP projection.

e. If patient is to be fed barium mixture, performer feeds patient with sterile bottle containing mixture or has this done. Observes patient until there is visible sign that patient has swallowed at least once. Is careful not to spill media.

f. If not yet completed, performer immobilizes patient in position. Places restraining bands, strips of gauze, and adhesive tape as needed. May use head clamp; may use clean diaper stretched diagonally across the table and over the patient's head. Avoids use of compression band across abdomen or chest. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

g. If, during positioning, patient shows signs of pain, performer may notify appropriate physician or nurse at once and awaits orders; may decide on alternative positioning to avoid movement of the affected part.

h. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the patient to the x-ray field, or centers the part to the film holder and uses the collimator light to center the tube to the part. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube position lengthwise or cross-wise to provide better centering.

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7. Performer provides appropriate collimation and shielding:

   a. Once the patient has been positioned and immobilized, performer adjusts the collimator so that a small unexposed border will appear around the edge of the film; collimates further so as to expose only the area of interest (and thus provide maximum protection and detail). For small fields performer attaches an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the part(s) of interest.
   b. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.
   c. Makes sure that anyone holding the patient (if absolutely necessary) or board, or remaining in room is supplied with lead gloves and apron and stays out of central beam as much as possible.
   d. Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.
   e. Performer observes patient's breathing, and plans exposure for the appropriate instant for the phase required (expiration unless otherwise ordered). Plans to start exposure after chest has begun to decline, timed so that exposure is made before inhalation begins.

8. Performer makes first (or next) exposure:

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   a. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.
   b. The performer returns to control panel. Makes sure controls are properly set and patient is still in position.
   c. If there is delay-exposure switch, starts rotor. Observes patient's breathing and times exposure to the appropriate instant for the phase required.
      Activates exposure for expiration after phase has begun.
   d. Performer initiates exposure by pressing hand trigger or exposure control button.

      i) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.
      ii) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
      iii) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cut-off, or overexposure due to faulty timer).
      iv) After exposure is completed, tells any adult with infant that he or she can relax.
      v) If the exposure is terminated by a circuit breaker, rechecks

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technical factors for possible overload, or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.

vi) After exposure performer returns to patient. Removes the cassette from the x-ray table or bucky. Removes any markers for further use. Removes patient from board.

vii) Performer repeats radiography steps for all exposures ordered before review by radiologist, adjusting technical factors, tube, and position of patient or cassette as appropriate to each view ordered.

viii) Performer may plan to have each radiograph processed and examined after exposure so that radiologist can terminate when appropriate and avoid unnecessary exposures.

ix) Performer may arrange to have the full set of processed radiographs reviewed by radiologist so that any additional views required can be made at once.

e. Performer arranges to have the exposure(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

f. While films are being processed, makes sure that patient is comfortable and attended by staff person, parent or self.

9. Throughout procedure performer observes patient for any signs of emergency and/or to prevent or respond to an accident. Is alert to signs suggesting faintness or any impairment in respiration.

a. Notifies nurse or physician at once if patient shows emergency signs.

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b. Makes sure that life support functions are being monitored and patient is never left unattended. Is especially careful to prevent patient falling.

10. Performer has processed films reviewed as appropriate:

a. If the first radiograph(s) are preliminary (scout) films, and/or are to be reviewed wet, or viewed as processed, performer brings the processed radiograph(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist that the radiographs are ready.

b. If the radiologist indicates that there is any problem with the technical factors, processing, or patient positioning, performer records or notes for later use in the examination, and/or repeats preliminary radiography as ordered.

c. When (or if) performer learns from the radiologist that a repeat or further conventional views and/or positions are to be undertaken, eliminated, or altered, or the location of foreign body, performer proceeds as appropriate according to instructions:

i) For further exposures performer repeats appropriate steps for next view(s) including identification of the cassette, use of R-L marker, the selection and setting of technique for next view (if different), positioning patient and equipment for focus-object-film alignment, proper collimation, shielding, immobilization.

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ii) If so ordered, performer may arrange to feed patient barium mixture by bottle as described earlier.

iii) As appropriate, performer continues with exposures at the proper respiratory phase.

iv) If patient is to be placed in erect position or lateral recumbent position for fluid or air level study, maintains patient in that position for the required amount of time prior to next exposure.

v) Continues to have radiographs processed and reviewed as appropriate.

vi) Performer refrains from commenting to parent or guardian on the films or providing any interpretation.

d. If performer is asked to repeat any exposures, makes sure that the additional exposures are warranted medically, since additional radiation will be incurred.

i) Notes whether need to repeat is due to performer's own carelessness or lack of attention so that performer can avoid future "retakes."

ii) If request for retakes reflects malfunctioning equipment, performer reports malfunction to appropriate staff member.

iii) If request for retakes reflects the preference for density or contrast of radiologist, performer notes for future work done for the given radiologist so that retakes can be avoided.

e. If appropriate, performer notes radiologist's orders for additional examination such as contrast study of appropriate part of

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gastrointestinal tract, follow-up films to trace the advancement of a foreign object.

11. When performer is sure that the examination has been completed, carries out termination steps for the examination:

a. Performer may have patient fed, transported back to room, to parent or guardian, or to next location, or decides to do personally, as appropriate.

b. Performer has equipment and examination table cleaned after use or decides to do personally, depending on institutional arrangements.

c. Performer records the examination according to institutional procedures. May include date, room, examination type, the views taken, the technical factors used and film sizes; may record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. If any views called for in the initial request could not be obtained, performer may record reasons. Signs requisition sheet.

d. If appropriate, has radiologist fill out and/or sign requisition sheet for current study and/or orders for new examination.

e. If performer will only carry out preliminary "scout" filming, and another co-worker will continue with examination, performer records the approved technical factors used for the scouts, and the accessories employed, or informs

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the co-worker who will continue. Performer gives the requisition sheet, name card, and any notes to the co-worker who will continue with procedure. f. Performer may decide to jacket films, requisition sheet, and related materials, and/or have information recorded in log book personally, or has this done, depending on institutional procedures. g. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured;parts measured; films identified;technical factors selected and set; technique for magnification set up;shielding applied; pt. positioned,immobilized;exposures made;radiographs sent for processing and evaluation;procedures repeated as appropriate for full set of views;patient returned;examination recorded;radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, technical history,prior radiographs;pen;x-ray unit, control panel,tube,bucky or film tunnel,table,collimator,extension cones;beam filter;technique,standard view,tube rating,and rad exposure charts;cassette holder;support stand;protractor;shielding;R-L and ID markers;immobilization devices,translucent panels,bands,tape,gauze;pillowcase,stockinet;calipers;stool;scissors;metal ruler,yardstick;view boxes; emergency cart;sterile gloves,gown,mask;padding;diapers;pacifier;toys;wax marking pen;order forms;phone; stretcher;wheelchair

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Pediatric patient to be radiographed;co-worker;radiologist;nurse;accompanying adult

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking plain film radiographs of the lower extremities of infant or pediatric pt. by reviewing request; reporting observed contraindications;reassuring pt., adult;measuring parts;setting up for magnification technique;selecting and setting technical factors; identifying film;positioning pt. and equipment for recumbent or erect exposure;immobilizing pt.;providing shielding;collimating;making exposures;having radiographs processed and reviewed;repeating for full set of views or as ordered;having pt. returned;placing radiographs for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for an infant patient scheduled for radiography of the lower extremities (covering pelvis, hip,femora, knees, legs, ankles and feet) or a pediatric patient scheduled for radiography of the long bones or feet as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

The plain films may serve as preliminary "scout" films for contrast studies such as arthrography, or may be part of survey series.

Depending on institutional arrangements, performer may also receive prior film(s) taken over time with record of technical factors and positions used and/or any changes necessary in technique.

1. Performer reads the requisition sheet to determine the examination called for, purpose, the patient involved, special considerations, and to check the completeness of the information provided:

   a. Performer checks the examinations called for in-

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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cluding the parts involved, the affected side, whether bilateral or unilateral studies are requested, and the purpose of the study.

b. Performer reads patient's name, identification number, sex, age, height, and weight. Notes whether patient is in-patient, out-patient, accident, or emergency patient. Notes the name of the radiologist in charge; may note name of referring clinician.

c. Performer notes the patient positions and views called for, the number of exposures, the central beam angulation, the areas of interest and joints to be included, the requested angulation of the parts.

   i) With long bone measurement or clubfoot evaluation notes whether order is for initial study. Notes the technique ordered. If part of existing series, plans positioning for exposures exactly as done before so that comparisons can be made. Notes accessories used.

   ii) Notes orders for any special views or whether standard series are requested, whether foreign body localization is required. With foreign body notes suspected location and entry site.

   iii) Notes whether magnification is ordered, whether there will be multiple views on a single long film. Notes orders on technique such as use of bucky, cassette tunnel, nonscreen holders, grid.

   iv) Notes whether patient will be standing, lying and/or sitting on x-ray table.

d. Notes any special information that will affect patient positioning, technique, immobilization, or handling of the patient, such as presence of accident injuries, unhealed or suspected fracture, bone infection, presence of plaster cast, splints (to be left in place or removed by a physician), extremities of unequal length, whether patient will be on a stretcher, in a wheelchair, in an incubator.

   i) With patients with unhealed or suspected fractures performer may make sure that a surgeon or radiologist is available to position the patient.

   ii) If lateral body positions are requested performer makes sure that there is no danger of fragment displacement, injury, presence of unhealed fracture or destructive disease. May check with MD.

e. Performer checks whether patient is suffering from a collateral condition requiring special handling such as respiratory or heart disease, communicable or infectious condition, retardation; notes whether patient has IV drip, oxygen supply, respiratory or similar devices in place; whether patient will be accompanied by nurse, other staff person, parent or guardian.

f. Performer checks prior preparation of patient:

   i) If patient's record indicates orders for sedation or any other prior medication or preparation, performer may check timing to be sure a proper elapse of time has occurred for medication to take effect. May arrange to delay examination if appropriate.

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ii) May note infant patient's feeding schedule and arrange to have patient fed while in department if not contrary to needs of examination.

g. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, and the examination ordered. Plans to take special precautions with neonate or ill patient such as use of gown, mask, sanitary procedures to protect patient from contamination or to prevent spread of infection. Notes appropriate shielding for examination.

h. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

i) Depending on institutional procedures performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether number of radiographic exposures ordered or done in past is extensive and should be brought to radiologist's attention.

ii) May review prior films and consider whether any exposures ordered can be eliminated. Notes any record of technical factors used.

iii) If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate and proceeds after obtaining needed information, signature, or orders.

i. If referring physician has requeted that prior film series on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. When performer is clear about what will be involved in examination, he or she prepares ahead so as not to keep patient in examination room longer than necessary:

a. If performer is not already assigned to examination room (and a particular machine) notes the room or machine involved. Goes to examination room for machine.

i) Checks for grid, film tunnel or high speed bucky as required.

ii) If magnification has been requested, performer checks that the machine to be used has a fractional focal spot of appropriate size for direct magnification technique (i.e. 0.3 mm or smaller).

iii) If patient will be standing on bench or table top (such as for weight bearing views),

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makes sure that equipment, particularly overhead system, is shock-proof. May insert wedge filter in x-ray tube for long bone study.

b. Performer washes hands as appropriate; depending on patient's condition, may decide to arrange for or carry out isolation or decontamination techniques.

c. If appropriate, checks that emergency cart has been prepared and is present or available, or decides to do personally. Checks that clean pacifiers and toys are present.

d. Checks that proper accessories for infant or pediatric patient are available for procedure including leaded rubber shielding for patient, aprons and gloves to be used by anyone who will remain in the room during exposure, gown, gloves, mask for performer.

e. Performer checks that appropriate immobilization devices for infant or child are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient, and cushion or box to sit on if patient is to be seated on table.

f. Makes sure that right (R) and left (L) markers are available for use and identification cards, leaded numerals or markers.

g. Performer makes sure that an adequate supply of loaded cassettes and/or nonscreen film holders of the appropriate types and sizes for infants and/or children are available in the examination room. If not, arranges to obtain or decides to obtain personally.

For long bone studies performer determines whether patient's

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size and the technique to be used requires that two or more films be abutted, taped, and placed in a long cassette to provide for exposure of hip, knee and ankle joints on a single film. If needed and not in room, orders from darkroom aide or decides to prepare personally in darkroom.

h. Performer prepares for identification of the films using equipment provided by institution:

i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.

ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write or type out ID information on card if not received with requisition.

iii) Checks identification against requisition sheet.

i. If long bone study is ordered, performer may obtain and tape a metal ruler to the top of film tunnel, or table with bucky, so that it will be in the area exposed on radiograph.

j. Checks that there is leaded rubber shielding available to be used to mask film and/or place beneath the film holder, as appropriate.

k. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation for change in machine output or a policy decision).

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1. Performer checks that the x-ray equipment is ready for use. Goes to the control panel and checks that indicator light shows that machine is "warmed up." If appropriate, performer may set the radiography mode selector and set the collimator control for manual operation.

3. If magnification has been requested, performer prepares the equipment for the tube-over-table method of magnification (used without bucky):

   a. Performer determines the degree of magnification requested on the requisition sheet; if the request is expressed as an area magnification performer determines the linear magnification by taking the square root.
   b. Performer calculates the required distances from target (focal spot) to object (patient) (TOD), and from object to film (OFD), as well as the distance from target to film (TFD) (the sum of TOD and OFD):

      i) If the distance from the table top to a cassette placed on the floor or a stool (OFD) will be a relatively inflexible distance, performer measures this distance or reads indicator scale. (If stool is to be used, may note the table height.) Performer may adjust table height to provide for a round number for the OFD.
      ii) If the distance from the focal spot to the table top (TOD) will be the relatively inflexible distance, performer determines what this is by measuring or reading appropriate indicator scale on tube housing. Performer may adjust tube height to provide a round number for the TOD.
      iii) Depending on whether the OFD or the TOD is fixed, performer calculates the required complementary distance by referring to a magnification chart for the degree of linear magnification required, or uses the formula: degree of linear magnification equals TFD divided by TOD. For a two-times linear magnification performer simply sets the TOD equal to the OFD.
      iv) Performer adjusts and locks the table height and/or the tube height to the calculated OFD and TOD.

   c. Performer aligns the object-film and target-object distances:

      i) Performer moves the x-ray tube housing until it is centered over the table top in the approximate area where the patient's area of interest will be positioned on table.
      ii) Performer swings the table out of the way so that there is no obstruction between the tube and the floor. (Does not change height.) If appropriate, places a stool on the floor under the tube. May place cassette of appropriate size on floor or stool. Performer uses the size film designated for the degree of magnification and the selected part to be studied.
      iii) Performer adjusts the collimation to correspond to the field size anticipated (for the TOD involved).
      iv) Performer activates the light in the collimator and adjusts

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the tube horizontally so that the light beam cast is centered to the cassette on the stool or floor. Uses the cross-hairs projected by the beam to center the tube to the area on the floor or stool.

v) Performer locks the tube into position so that there is a 90° angle of the beam with the floor or stool. Fixes and retains collimator setting.

vi) Performer marks the outline of the collimated light area or cassette on the floor or stool using tape or other removable marker. If not already done, checks by placing cassette in marked area. May mark center of area as shown by cross-hairs.

vii) Performer swings table back into place. Activates light beam in collimator and marks the table top where the center cross-hairs and light outline are projected (to be used to center the part to be radiographed). Uses tape or other radiolucent removable marker.

viii) Performer may recheck TOD and OFD to be sure that they correspond to the calculated distances.

d. For magnification technique using a vertical film holder, adjusts upright holder to appropriate height; adjusts x-ray tube to right-angle horizontal projection of beam to film holder; centers to the film; measures and adjusts TOD to expected patient's position and marks location of position; measures and adjusts OFD from position as marked.

e. If the sum of the new TOD and OFD (TFD) is now different from the TFD used for non-magnification technique, performer may consult technique chart to note the factor to use for a compensatory change in mAs. May record for later use in setting exposure factors.

f. Performer may also note the change in kVp and mAs necessary to compensate for any change in collimation from non-magnification technique. Consults appropriate chart for conversion factor. May record.

4. Performer readies patient for the examination:

a. Performer washes hands as appropriate. Depending on patient's condition, may decide to carry out isolation or decontamination techniques. May don gown and mask.

b. Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.

c. Performer greets patient and any accompanying staff person and/or parent or guardian, and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

d. If not already done, performer places padding on x-ray table and makes patient comfortable:

1) If patient is on special stretcher, places stretcher into position so that radiolu-

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cent stretcher can be lifted with patient on it from wheeled base to x-ray table.

ii) With suspected fractures or accident patient, may have surgeon or radiologist position the patient. May have patient remain on stretcher until injury has been localized.

iii) If patient is in wheelchair, moves patient in chair into position next to table. Locks chair into position.

iv) Performer may decide to assist child to table or has this done. May obtain help. Makes sure that no equipment is in the way or may be collided with by patient. If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.

v) May have nurse carefully place infant in supine position on table, or lifts patient carefully, supporting infant's head, and places on table.

vi) Makes sure patient is being attended and there is no danger patient will fall off table. Makes sure patient is never unattended.

e. If not already done, has patient's clothing removed and has patient put in gown and kept warm as appropriate.

i) If there is an injured limb to be radiographed, performer removes clothing from unaffected side before slipping off affected side.

ii) If patient may be suffering from a fracture, performer has staff member in attendance remove the necessary clothing from the area.

iii) If there is a splint or cast on injured area to be removed, performer has removed by appropriate staff member; does not remove personally.

iv) If there is a wet dressing involved, performer has it reinforced or decides to do personally.

v) If patient has a life support system in place, such as incubator, respiration, cardiac or infusion equipment, makes sure that equipment is being monitored.

f. Depending on institutional arrangements and condition of patient, performer may indicate to parent or guardian that he or she must wait outside of examination room or that he or she may remain in room to help reassure patient.

i) Performer may provide privacy while mother breast feeds infant or may provide bottle and have patient fed.

ii) Answers patient's, parent's or guardian's questions honestly; attempts to reassure and develop confidence. Remains aware that patient and/or adult may be frightened and/or patient in pain. Performer explains to adult when asked medical questions that it is not appropriate for technologist to answer these; encourages adult to speak to physician.

g. Performer attempts to develop a warm interaction with patient so that infant or child remains calm

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during examination. May hold patient; may speak to patient in calm, gentle voice; may provide clean pacifier or toy.

i) Performer attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of retardation. Is as calm and gentle as possible.
ii) With child, performer tells patient what will happen, and rehearses aspects of the procedure. Shows how x-ray unit and table moves. May give patient clean toy. Performer explains truthfully if patient can be expected to feel any pain. Indicates how patient can help.
iii) If patient is difficult to calm, performer may have parent who is present leave, or if parent has left, may try having parent help calm patient.
iv) If patient continues to be unmanageable, performer may consider requesting that procedure be delayed until child is more quiet. May discuss possibility of sedation with radiologist. If ordered, arranges to have administered.

h. Performer may question parent, RN or MD present on what movement is possible in the affected extremity and on the opposite side to determine what positions are available for use:

i) May question child about any injury or pain to determine what mobility is possible.
ii) Performer notes whether patient can be examined in the standard positions called for with the projections ordered; if not, plans to substitute alternative positions.
iii) If movement is limited or fracture is suspected, performer decides on x-ray tube and patient positions to accomplish the radiography with a minimum of movement of the patient. May decide to use upright film holder in appropriate positions with patient stationary to accomplish this.
iv) Performer may examine patient visually. Notes the patient's body type, whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points will be easy to find. Notes whether the extremities are of unequal length. Notes whether there is a soft tissue abnormality such as swelling or atrophy which could cause rotation of the pelvis.
v) Performer may evaluate whether patient can tolerate having the affected part placed flat on film holder or requires alternative positioning with use of an angulation block.
vi) If there is a suspected foreign body in the foot, performer determines the point of entry and tapes a small lead marker over the point.
vii) Performer may consider whether two or more projections can be combined to reduce exposure. For long bone study may determine how long cassette can be used to project areas of interest with minimum exposures on a single film. If bilateral views are ordered plans to make bilateral projections with a single exposure if possible.

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i. Performer may measure the patient for the dimensions relevant for the views ordered. May use centimeter calipers to measure the thickness of.the part(s) to be radiographed in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors.

   i) With fracture or accident patient may have surgeon or radiologist position the patient for measurements.
   ii) After measuring, has patient rest in as relaxed a position as possible.

j. Performer considers the number and types of projections ordered for the examination and the patient's condition. Performer may consider a change from standard projections to better accomplish the purpose of the examination, or deletion of a position. Depending on institutional arrangements, performer may obtain permission from appropriate radiologist or decides personally to alter the standard procedure within institutional guidelines.

k. Performer provides patient and everyone who will remain in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure. If a staff member or parent or guardian will be asked to assist in positioning, performer provides leaded gloves and apron.

5. After making sure that patient is being attended, performer sets up equipment for the examination before positioning and immobilizing patient:

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a. Depending on whether a bucky, film tunnel or table top technique will be used, whether nonscreen holders or cassettes, and standard institutional practices, performer selects speed and type of film, grid, and film holder combination:

   i) Selects size of film based on the areas to be included in central beam, patient's size, whether unilateral or bilateral projections are to be made, whether multiple views are to be exposed on a single film. May obtain curved cassette or flexible film holder for "tunnel view" of knee.
   ii) For magnification technique, performer selects the size of film designated for the degree of magnification, the patient's size and the area of interest.

b. Performer obtains the appropriate size loaded cassette or nonscreen holder for the first (or next) projection.

   i) If several exposures will be made on one film, performer mentally decides how the cassette or film holder will be masked and shifted in film tunnel or grid tray without moving patient and so that radiograph need not be turned for viewing each image.
   ii) Performer uses leaded rubber sheets, and masks the film holder completely except for the first (or next) area to be exposed. Performer treats the area to be exposed from this point as though it were the actual film size.

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iii) May mark midpoint of each film holder or cassette (or each section of a film holder or cassette masked for multiple views). Uses radiolucent marker.

c. Performer attaches identification information to the film holder, cassette or table top:

i) Places right or left marker on film holder, cassette, or table top as appropriate to the study and projection, or depresses appropriate R or L button for automatic marking.
ii) If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.
iii) If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
iv) Performer may place patient's card into card tray for equipment using automatic film marking device.

d. Performer places film holder or cassette in approximate position for first (or next) exposure:

i) If appropriate, performer may place cassette in upright holder at right angles to table top or in other position selected. May place in film tunnel.
ii) If cassette is to be used with bucky (under table top or in upright holder) may manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed.

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Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers. Centers partially masked cassette so that the unmasked portion of cassette is centered to central beam.

iii) If a table top technique is to be used, places film holder in a position approximating final positioning. If magnification technique is to be used, performer places cassette in marked position on floor or stool. May place leaded rubber sheet under nonscreen film holder.
iv) With accident patient, after localization has been established, performer may obtain assistance in lifting any part under which a cassette or film holder must be placed while the injured part is supported.

e. Performer selects the exposure factors for the first (or next) projection. May consult the technique chart posted for the machine:

i) Locates the information needed for the body part and projection involved according to the thickness of the part and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed, focal spot size, FFD and use or nonuse of other accessories (such as screens, grids, bucky, etc.).
ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.

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iii) Once the standard kVp, mA and time have been determined, performer notes whether any conversions are necessary to account for patient's age, a pathological condition, cast, a change in FFD, the preference of the radiologist in charge, and any other conversion needed such as with magnification technique or posted change. Performer looks up numerical conversion factors and calculates or uses conversion chart to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.

iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

f. Performer sets exposure factors as selected:

i) Goes to control panel. Makes sure that indicator light shows that x-ray generator is ready for use. Makes sure that all circuits have been stabilized. Checks that controls are set for radiography mode.

ii) As appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

iii) For conventional exposure control, performer selects milliamperage and chooses selectors for the correct focal spot size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

iv) For automatic phototimed exposure control, performer selects and sets the category corresponding to the type of study and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming).
May select and set a kVp range button (if called for with the equipment) corresponding to the range for the examination.
Sets a density selector corresponding to the usual (or special) requirements for the study.
Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustment of table and tube height, position, and collimator (unless these have already been set as with magnification technique).

vi) Performer may return to overhead unit and set the focal-film distance (if not already done, as with magnification technique). Operates controls or manually moves the x-ray tube into place over the film

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holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD is obtained.

6. Performer prepares the patient in the position selected for the first (or next) exposure (unless this is done by physician or nurse):

   a. May explain or demonstrate to parent or staff member what is required for immobilizing. May obtain help; may have nurse or MD position and immobilize in accident and fracture cases or does preliminary filming without moving patient.
   b. For unilateral exposure makes sure that correct side is being positioned. If comparison studies are ordered places the unaffected side in same position as side of interest.
   c. In positioning and immobilizing injured patient or infant, performer may use supine positioning. Uses horizontal beam to avoid rotating patient for lateral projections.
   d. If patient's extremities are of unequal length, performer may note whether the legs or the femora are unequal. Makes adjustment in positioning at the joint above the unequal part, such as placing pelvis so that greater trochanters are in the same transverse plane for unequal femora, and knees at same transverse plane for unequal legs. In immobilizing is careful to position and support feet to avoid rotation of the upper ends of the femora.
   e. If required for the study performer may mark patient's body with

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localization marks using skin marking pen. For long bone measurements has patient lie or places patient in supine position and marks the joints bilaterally.

i) Performer locates the hip joint by defining a line between the anterior superior iliac spine and the symphysis pubis. Determines the midpoint and defines a line at right angles to the first line at the midpoint, and finds a point on the second line about a half inch below the first. Marks this point for centering.

ii) Performer locates the knee joint by finding a point just below the apex of the patella at the level of the depression between the femoral and tibial condyles.

iii) Performer locates the ankle joint by finding a point directly under the depression midway between the malleoli.

iv) Performer localizes the long axis of the femoral neck by locating the anterior superior iliac spine and the upper margin of the symphysis pubis. Defines a line between them. Palpates the greater trochanter of the femur and marks a point a half inch below its most prominent part. Defines a line from the point marked to the midpoint of the first line as the long axis of the femoral neck.

f. If there is a tumor or tenderness on dorsal side of patient, elevates patient's body on soft cotton. If soft tissue swelling or atrophy causes rotation of pelvis, performer elevates low side on radiopaque support and checks that

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femora are equidistant from the film (for supine positioning).

g. Performer may immobilize patient's arms by extending them and placing them along sides of head, next to the ears. May apply a sleeve made of a diaper, towel, pillowcase or orthopedic stockinet to hold arms so that sleeve holds arms above and behind head, one at each side. May apply a sleeve of stretch gauze or bandage to the pelvis. Wraps lightly to maintain patient in position.

h. Performer centers the part keeping the long axis of the part parallel to the film holder. When using a film tunnel or bucky, centers patient to midline. With film holder or cassette on table top, centers film to part. With upright holder adjusts height of holder to part and centers part to film.

7. Performer positions and immobilizes patient (or has this done) as follows:

   a. For studies of the infant pelvis and hip joint(s), performer notes whether bilateral or unilateral views are required; makes sure that there is no danger of fragment displacement, injury, or presence of unhealed fracture or destructive disease before placing patient in any abducted or rotated body positions.

      1) For AP projection (posterior view) of the infant pelvis and hip joint, performer places patient in supine position. Aligns the median sagittal plane of the body to the midline of the table. Extends both legs and supports knees. Supports ankle joints and adjusts to same transverse plane.

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For extremities of unequal length adjusts as described above. Inverts feet so that long axes of femora are parallel with plane of film by grasping heels and turning feet medially without forcing. Performer may check that there is no rotation of pelvis by measuring the distance from the anterior superior iliac spine to table top on each side. Overcomes rotation of pelvis due to swelling or atrophy by elevating appropriate side. Immobilizes upper extremities as described or tapes at sides with elbows comfortably flexed. Immobilizes hips and legs with sponges, gauze, tape or webbing bands. Centers median sagittal plane to midline for bilateral view; centers hip joint to midline for unilateral view; -- at the level of the highest point of the greater trochanter(s). Directs central ray to midpoint at right angles to film, or as ordered.

      ii) For an axiolateral view ("frog" position) of the infant femoral neck(s) and hip(s) and oblique view of pelvis, performer maintains the patient in a supine position. For a bilateral view aligns median sagittal plane of body to midline. For unilateral view centers the anterior superior iliac spine of the affected side to the midline. Immobilizes arms and body in AP position and checks that there is no rotation of the body. Flexes the knees (or knee on side of interest) and abducts

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List Elements Fully

thigh(s). Turns feet (or foot on side of interest) inward as close to the buttocks as possible. Centers and immobilizes feet (foot).

For unilateral study, extends unaffected extremity and supports knee and ankle.

For bilateral view, adjusts thighs so that abduction is equal and the long axes of the femoral necks are parallel to the plane of the film. Adjusts central ray angle to parallel the long axes of the femoral shafts, centered to the symphysis pubis.

For unilateral projection, positions cassette vertically on affected side with its long axis parallel to the long axis of the femoral neck, and as far as possible into the depression above iliac crest. Supports with sandbags. Inverts foot slightly. Directs central ray at right angles to long axis of femoral neck to hip joint point (as described above) and under the opposite knee if flexed.

b. For pediatric long bone measurement study, performer notes exactly how prior studies were done, or, if first of series, whether patient is to be supine (such as infants) or in erect position. Notes whether film(s) will include entire lower extremities, bilaterally covering hips, femora, knees, legs and ankles, or will include bilateral spot "scanograms" of the joints. Plans to position patient once and use masked film holders to obtain the exposures necessary on a single film if possible, by moving film holder. If not already done, performer may insert wedge filter in x-ray tube so that the thick part is towards the ankles when the patient is supine.

1) For supine AP projections of pediatric long bones or joints, performer aligns patient in supine position so that the median sagittal plane of the body is at the midline of the film tunnel or table, with the unmasked part of the film centered to the joint to be exposed or to the level of the midpoint of the area to be exposed. Arranges lower extremities for bilateral projections.

Extends the lower extremities equally with ankles separated 5 or 6 inches or as ordered. Arranges unaffected knee joint to no more extension than is possible on affected side, and supports both on pads of identical size. Checks that joints are bilaterally equidistant from film. Places supports against soles of feet to immobilize and dorsiflex so that the ankles are in near right angle flexion. May place patient so that footboard serves as support. Immobilizes with tape if necessary.

For filming entire lower extremities, plans minimum number exposures from hip joints to ankles to avoid double exposure. Centers unmasked portion of film to first (or next) bilateral projection midway between upper and lower border of first (or next) area of interest.

For spot scanograms, plans a closely coned exposure of each

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joint (six successively, or three bilaterally).

Makes sure that metal ruler is placed so that it will be radiographed with each exposure and not overlap with patient's area of interest. Directs central ray at right angles to film at midpoint of area of interest;(for scanograms to marked points of joints or midway between contralateral points marked on joints).

ii) For erect AP projections of pelvis, hip joints and lumbar vertebrae for pediatric long bone measurement, performer has child stand barefoot in front of a vertical bucky.

Adjusts the feet so that they are parallel, with about seven inches between, and equidistant from midline. Checks that patient's weight is equally distributed on both feet. May apply compression band across pelvis and recheck that there is no rotation.

Centers the film to the median sagittal plane of the body and to a point midway between the superior iliac spines and the iliac crests.

Performer measures the distance from the patient's hip joints (as marked) to the floor. Adjusts the x-ray tube so that the focal spot is the same distance above the floor.

Places a lead marker on the cassette at the level of the hip joints so that it will be radiographed but not overlap with area of interest. Directs the central ray to the midpoint of the film (at an oblique angle).

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c. For studies of the infant knee and/or lower leg, performer notes whether unilateral or bilateral views are ordered. Positions for bilateral views so that both legs and joints will be projected with one exposure. If a patellar fracture may be involved, makes sure not to flex the knees more than 10°.

i) For AP projection (posterior view) of infant knee(s) and/or leg(s), performer places patient in supine position on table with no rotation of the pelvis. Extends the leg(s) in AP position and inverts the foot (feet) slightly without rotating leg(s). Supports sole (s) with sandbags. Centers film holder under the area of interest.

If only the knees will be radiographed centers film to the apex of the patella, and rotates leg(s) so that a line through both the femoral epicondyles is parallel with the plane of the film.

Supports ankles. Immobilizes as appropriate. Directs the central ray as appropriate to purpose of study (at right angles to film for legs and bones of joint, and 5° to 7° cephalad for joint spaces).

ii) For lateral projection of infant knee and/or leg, performer maintains patient in supine position and uses vertical cassette placed against side of interest at right angles to table top.

For study of knee, notes whether knee is to be in partial or

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right-angle flexion. Flexes and supports as appropriate. Adjusts supports so that patella is at right angles to film. Centers film to center of area of interest and directs central ray horizontally across table to midpoint of film or at angle specified.

iii) For semiaxial AP projection, "tunnel view," of infant knee, maintains patient in supine position with no rotation in body. Adjusts the elevation of the leg and flexion of the knee so that the leg and femur form a 120° angle. Supports knee. Adjusts leg in AP position. Places curved cassette or flexible film holder beneath the posterior surface of the knee, centered so that central ray will enter the "notch" at a right angle to the long axis of the tibia at the center of the cassette or holder. Immobilizes foot.

d. For studies of the ankles and feet (other than club foot study) performer examines child as for nonpediatric examination. For infant, proceeds as follows:

1) For the infant foot, performer centers with reference to the appropriate metatarsal bone. If request is for foreign body localization, or position or alignment of fracture fragments, performer makes AP (dorsoplantar) and lateral projections. For foreign body localization performer determines the point of entry and tapes a small lead marker over the point.

For dorsoplantar (AP) projection (plantodorsal view) of

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infant foot, performer places patient on table in supine position. Flexes patient's knee (s) so that the soles of the feet rest on the table, centered on film holder to the proximal end of the third metatarsal, with long axis of film and foot parallel. As an alternative, performer may keep film holder in contact with the plantar surface of the foot by using an angulation block. Performer uses sponges and/or compression bands to immobilize; may place a non-skid mat to keep film holder from slipping on table. Depending on orders, positions tube to enter centered part at right angles to film or at 15° cephalad.

For lateral projection of infant foot, performer maintains patient in supine position. Places cassette vertically on table on medial side of affected foot so that it is in contact with film holder. Adjusts so that the plantar surface of the foot is at right angles to the film. Centers film holder to the proximal end of fifth metatarsal with the long axis of the film and foot parallel. Directs central ray horizontally at right angles to film.

For oblique dorsoplantar projection of infant foot, keeps patient in supine position; flexes knee of affected side and places sole of foot on table on film holder. Rotates patient's leg medially or laterally as appropriate. Supports elevated side of foot. Rotates

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leg medially or laterally depending on the metatarsal interspaces to be viewed. Centers film holder to the appropriate metatarsal bone and directs central ray vertically at right angles to film.

ii) For an oblique view of the infant ankle (tarsus), performer places patient in supine position. Centers film holder to the ankle joint. Rotates entire leg and thigh to 45° externally for a lateral oblique projection. For a medial oblique projection elevates hip and rotates leg and thigh 45° internally. For a "mortise" oblique projection rotates leg internally until the medial and lateral malleoli are parallel to the film holder. Uses foam wedge and sandbags to support, or footboard. Directs central ray vertically at right angles to film through ankle joint.

iii) For studies of the infant calcaneus (os calcis) (bilateral: calcanei), performer notes whether patient is to be studied bilaterally (both feet on one view) or unilaterally.

For plantodorsal (PA) projection of infant calcanei, performer maintains patient in supine position with both legs fully extended (for bilateral study). Centers film holder under ankles to include both joints. Performer elevates extremities to obtain position in which the soles of the feet are at right angles to table top. Angles tube at 40° cephalad to the soles of the feet, entering the plantar surfaces at the base of the fifth metatarsals.

For lateral projection of infant calcaneus, performer maintains patient in supine position. Flexes knees and partially extends extremity on affected side. Centers vertically placed cassette in holder on affected side to the calcaneus. Rotates heel until a true lateral position is obtained, with long axis of film parallel with plantar surface of heel. Directs central ray at right angles to the film holder at center of part.

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e. For pediatric club foot studies performer carefully notes positioning ordered or carried out for prior films. Notes whether unilateral or bilateral views are requested. Notes whether patient will be supine, seated or erect. Performer is careful not to change any abnormal alignment of the foot when placing it on the cassette.

i) For supine dorsoplantar (frontal) projection of clubfoot, performer places firm pillows under patient's body, high enough so that the knees can be flexed and the soles placed flat on a cassette lying on the table top. Allows flexion in hips and knees as needed to place sole(s) flat on cassette with leg from knee to ankle exactly at right angles to the cassette. Extends ankles slightly to avoid superimposition of leg. Uses bands across pelvis and tapes legs into position; immobilizes feet so that legs remain vertical.
If affected foot is so abducted that feet overlap, performer exposes each one separately. If necessary, has adults hold knees

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and toes to maintain position. Performer directs central ray at right angles to cassette, directed at the tarsus (or directed midway between the tarsal areas for bilateral view).

ii) For a seated dorsoplantar (frontal) projection of clubfoot, performer has patient sit on pillows or box placed on table, with soles of feet resting on cassette placed on table, and with legs perpendicular to cassette. Immobilizes. Continues as described in (i, above).

iii) For erect dorsoplantar (frontal) projection of clubfoot, has patient stand on cassette or be held in a vertical or bending forward position, with feet on cassette. Has weight distributed equally on both feet. Directs the central ray at an anterior angle of 40°, directed, for unilateral view, through the dorsal surface of the ankle or lower leg, and emerging on the plantar surface at the level of the fifth metatarsals. For bilateral view directs the central ray midway between the two dorsal points and two plantar points at 40° anterior.

iv) For a lateral recumbent projection of the clubfoot, performer lies infant or child unable to stand on table on the side of interest in a lateral position. Performer flexes the uppermost (opposite) extremity and draws it forward out of the area of exposure. Immobilizes or, if necessary, has the extremity held in position by adult. Performer places cassette and a support of the same thickness as the cassette so that the foot on the side of interest is lying in lateral position on cassette, leg is parallel to the cassette, with knee on support. Places the foot laterally against cassette without angulation. Performer places plywood or a plastic panel vertically against plantar surface of foot with a gentle force to simulate weight bearing. Supports in position. Performer immobilizes foot as appropriate. Directs central ray vertically at right angles to cassette, entering the midtarsal area.

v) For a weight-bearing erect lateral projection of the clubfoot, performer has patient stand on table or platform. Makes sure no obstructing objects are in the way. Performer instructs patient in how to raise unaffected leg and perhaps rest it on convenient surface, and hold on to available support. With weight on leg and foot on side of interest, performer positions cassette vertically and supports in lateral position against side of foot. Directs central ray horizontally at right angles to cassette, entering the midtarsal area. Has patient rest on both feet until performer is ready for exposure. Rehearses patient.

f. Performer immobilizes patient as appropriate. May use plastic panel held in place by sandbags. May use restraining bands, tape, a clean diaper stretched diagonally across the table and over the patient's head or pelvis. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration, and other vital functions.

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g. If, during positioning, patient shows signs of pain, performer may notify appropriate physician or nurse at once and await orders, or may decide on alternative positioning to avoid movement of the affected part.

h. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size (or the size of the unshielded area of the film to be exposed). Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the patient to the x-ray field, or centers the part to the film holder, and uses the collimator light to center the tube to the part. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view disired. May readjust tube position lengthwise or crosswise to provide better centering.

8. Performer provides appropriate collimation and shielding:

a. Once the patient has been positioned and immobilized, performer adjusts the collimator so that a small unexposed border will appear around the edge of the film and collimates further so as to expose only the area of interest,such as joints (and thus provide maximum protection and detail). May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the part(s) of interest.

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b. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.

c. Makes sure that anyone holding the patient (if absolutely necessary) or remaining in room is supplied with lead gloves and apron and stays out of central beam as much as possible.

d. Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

9. When everything is ready for the exposure, performer prepares for control of respiration movement during exposure.

a. With child, explains the need to keep perfectly still when indicated by performer (or to hold breath for erect long-bone views) until told to relax. May practice with child.

b. With infant observes patient's breathing, and plans exposure for the appropriate quiet instant as required.

10. Performer makes first (or next) exposure:

a. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

b. The performer returns to control panel. Makes sure controls are properly set and patient is still in position.

c. As rehearsed, tells child to raise opposite leg for lateral clubfoot

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study. Tells child when to hold breath or hold still by calling or using intercom; or observes infant's breathing and times exposure to the appropriate instant for the phase required.

d. Performer initiates exposure by pressing hand trigger or exposure control button.

  i) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.
  ii) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
  iii) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cut-off, or overexposure due to faulty timer).
  iv) After exposure is completed, tells child or any adult with infant that he or she can relax.
  v) If the exposure is terminated by a circuit breaker, rechecks technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.
  vi) After exposure performer returns to patient. Removes cassette or film holder from table, floor, bucky or film tunnel. Removes any markers for further use. If multiple views are to be made on the film, removes leaded rubber mask and remasks all but next area to be exposed. If appropriate, moves cassette into next position in cassette or film tunnel.
  vii) If the patient is being examined for a possible fracture, or if so requested, performer arranges to have the first exposure processed at once and brought to the appropriate radiologist.
  viii) Performer may plan to have each radiograph processed and examined after exposure so that radiologist can terminate when appropriate and avoid unnecessary exposures.
  ix) Performer repeats radiography steps for all exposures ordered before review by radiologist, adjusting technical factors, tube, and position of table or film holder as appropriate to each view ordered. For bilateral study in lateral projection reverses side of interest and repeats for unaffected side in same positions and flexions.
  x) Performer may arrange to have the full set of processed radiographs reviewed by a radiologist so that any additional views required can be made at once.
  xi) Performer arranges to have the exposure(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

e. While films are being processed, makes sure that patient is comfortable and attended by staff

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person, parent or self. May have child relax in examination room or holding area. Explains what will happen next.

- i) Performer determines whether child should remain on table and/or in room or must remain in position without moving. May consult requisition sheet or attending RN and proceeds as indicated.
- ii) If appropriate, moves x-ray tube and any protruding film holder away from child before he or she rises.
- iii) May decide to assist child to chair or stretcher or from table. Makes sure patient is reminded of any footrest in stepping off table.

11. Throughout procedure performer observes patient for any signs of emergency and/or to prevent or respond to an accident. Is alert to signs suggesting faintness or any impairment in respiration.

    a. Notifies nurse or physician at once if patient shows emergency signs.
    b. Makes sure that life support functions are being monitored and patient is never left unattended. Is especially careful to prevent patient falling.

12. Performer has processed films reviewed as appropriate:

    a. If the first radiograph(s) are preliminary films, and/or are to be reviewed wet, or viewed as processed, performer brings the processed radiograph(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist that the radiographs are ready.
    b. If the radiologist indicates that there is any problem with the technical factors, processing, or patient positioning, performer records or notes for later use in the examination and/or repeats preliminary radiography as ordered.
    c. When (or if) performer learns from the radiologist the extent of the injury and/or whether further conventional views and/or positions can be undertaken, eliminated, or altered, performer proceeds as appropriate according to instructions:

        - i) For further exposures performer repeats appropriate steps for next view(s) including identification of film holder or cassette and use of R-L marker, selection and setting of technique for next view (if different), positioning patient and equipment for focus-object-film alignment, proper collimation, shielding, immobilization, and making exposure, as described. For multiple exposures on one film, keeps R-L reference constant; centers using the point marked earlier.
        - ii) Performer refrains from commenting to parent or guardian on the films or providing any interpretation.

    d. If performer is asked to repeat any exposures, makes sure that the additional exposures are warranted

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medically, since additional radiation will be incurred.

  i) Notes whether need to repeat is due to performer's own carelessness or lack of attention so that performer can avoid future "retakes."
  ii) If request for retakes reflects malfunctioning equipment, performer reports malfunction to appropriate staff member.
  iii) If request for retakes reflects the preference for density or contrast of a radiologist, performer notes for future work done for the given radiologist so that retakes can be avoided.

e. If appropriate, performer notes radiologist's orders for additional studies such as contrast study.

13. When performer is sure that the examination has been completed, carries out termination steps for the examination:

a. Performer may have patient fed, transported back to room, to parent or guardian, or to next location, or decides to do personally, as appropriate.
b. Performer has equipment and examination table cleaned after use or decides to do personally, depending on institutional arrangements.
c. Performer records the examination according to institutional procedures. May include date, room, examination type, the views taken, the technical factors used and film sizes; may record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any

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problem with equipment, any special care provided patient. If any views called for in the initial request could not be obtained, performer may record reasons. Signs requisition sheet.
d. If appropriate, has radiologist fill out and/or sign requisition sheet for current study and/or any new orders.
e. If performer will only carry out preliminary "scout" filming, and a co-worker will continue with examination, performer records the approved technical factors used for the scouts, and the accessories employed, or informs the co-worker who will continue. Performer gives the requisition sheet, name card, and any notes to co-worker who will continue with procedure.
f. Performer may decide to jacket films, requisition sheets, and related materials and/or have information recorded in log book personally, or has this done, depending on institutional procedures.
g. May indicate to appropriate staff person when the performer is ready to proceed with the next examination.

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This is page 1 of 13 for this task.

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;skull measured;films identified;technical factors selected and set for fluoroscopy,spot filming,overheads;scouts taken;radiologist assisted with instillation,positioning,fluoroscopy, spot films,removal of contrast;overhead exposures made;radiographs sent for processing,taken to radiologist;pt. returned;examination recorded;radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, medical-technical history,prior radiographs;view boxes;pen;x-ray generator,control panels,tube,bucky, table,collimator;fluoroscopy unit,image intensifier, spot film device,TV monitor;cassettes;roll film;extension cones;R-L,ID markers;radiopaque contrast medium;sterile procedure tray;emergency cart;scissors; metal ruler;plastic wrap;sterile gloves,gown,mask; padding;protractor;wax marking pen;calipers;upright holder;lead aprons,shielding;immobilization devices, head clamp,band,tape,gauze;technique,standard view, tube rating and rad exposure charts;forms;phantom or test object;stretcher;phone

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Infant pt.;radiologist;nurse;accompanying adult;anesthesiologist;co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking radiographs for choanal atresia study of infant pt., by reviewing request;preparing equipment; measuring part;setting up for fluoroscopy,spot filming;setting technical factors;identifying films;providing shielding;taking scout films;assisting radioogist using sterile technique in positioning pt.,instillation of contrast,fluoroscopy,spot filming;taking overhead radiographs as ordered;arranging for processing;assisting with removal of contrast;having pt. returned;placing radiographs for use;recording.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for an infant patient scheduled for choanal radiography (contrast study of the paired openings between the nasal cavity and the nasopharynx) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, and to check the completeness of the information provided:

    a. Performer checks the examination called for and the purpose. Notes whether patient is a neonate with immediate diagnosis and treatment of bilateral choanal atresia necessary to prevent death from asphyxia. Notes whether bilateral or unilateral atresia is suspected, and which nostril is involved if unilateral.
    b. Notes the name of the radiologist in charge; may note the name of the referring clinician.
    c. Performer reads patient's name, identification num-

OK-RP;RR;RR

6. Check here if this is a master sheet..(x)

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ber, sex, age, weight. Notes whether patient is in-patient, out-patient, or emergency patient.

d. Performer checks whether patient is suffering from a collateral condition requiring special handling such as communicable or infectious condition, presence of oropharyngeal airway to prevent respiratory distress,or feeding tube. Notes whether patient will be accompanied by nurse, other staff person, parent or guardian. Notes whether anesthesiologist will be present.
e. Performer notes whether fluoroscopy will be combined with spot filming and overhead radiography. Notes whether the use of a grid or bucky will be involved. Notes any special requests, such as for measurement of an occluding septum. If so, plans to place metal ruler as appropriate in exposure field.
f. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, and the examination. Plans to take special precautions with neonate such as use of gown, gloves, mask, isolation procedures to protect patient from contamination or to prevent spread of infection. Notes appropriate shielding for examination.
g. May note patient's feeding schedule and arrange to have patient fed while in department if not contrary to needs of examination and patient's condition.
h. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

    i) Depending on institutional procedures, performer may note whether the examination has been done at the institution or elsewhere there in recent past, whether there is history of extensive radiography to be brought to radiologist's attention.
    ii) If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to select technique or prepare for examination, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

i. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so the patient need not be kept in examination room longer than necessary:

    a. Performer washes hands as appropriate; may decide to arrange for or carry out isolation or decontamination techniques.
    b. Checks that sterile procedure tray has been prepared for the examination or decides to do personally.

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Checks that emergency cart is present. Checks that radiopaque contrast shows no chemical deterioration.

c. Checks that proper accessories for infant patient are available for procedure including leaded rubber shielding, aprons, and gloves to be used by performer, radiologist, the patient, and anyone who will remain in the room during exposure, sterile gowns, masks, gloves, appropriate immobilization devices for infant, and mattress, pads, pillows and/or blankets for comfort of patient. Checks for vertical cassette holder.

d. Performer checks that x-ray equipment is provided with grid and/or high speed bucky and that overhead and fluoroscopy capabilities are available.

e. Makes sure that right (R) and left (L) markers are available for use and identification cards, leaded numerals or markers.

f. Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes for overhead filming of infant are available in the examination room. If not, arranges to obtain or decides to obtain personally. May obtain transparent plastic wrap for cassettes for table top use, to protect patient from contact with cassette.

g. Performer prepares for identification of the overhead films using equipment provided by institution:

   i) May obtain lead numerals and tape and prepare identification strip for placement on cassettes giving appropriate patient identification information.
   ii) Performer may prepare for use of flashcard by checking that there is piece of lead on cassette surfaces; may write or type out ID information on card if not received with requisition.
   iii) Checks identification against requisition sheet.

h. If examination will include spot-filming using a camera (attached to image intensifier) and roll film, performer checks film supply indicator to make sure that there is sufficient film in the roll film cassette.

   i) If there is insufficient roll film in camera, performer arranges to have roll film cassette loaded, or decides to do personally.
   ii) When loaded roll film cassette is obtained, performer checks loading in subdued light. Checks that end of film is cut correctly and is properly threaded and attached to take-up spool so that film unwinds appropriately. Checks that film is properly engaged on sprocket. Locks into operating position. If appropriate, cuts off excess film at exit port and removes. Attaches film cassette to camera and locks into place. Replaces camera cover.
   iii) If there is an adequate film supply, checks that film is properly loaded.
   iv) Performer advances film to compensate for any exposure of film due to installation or check.
   v) Remove dark slide from camera lens.
   vi) If not already done, performer writes or types a card with patient's identification information for use with spot

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film device. Inserts in slot in spotfilm camera as appropriate.

i. If examination will include spot filming using a cassette/bucky spotfilm device, performer checks that there is an adequate supply of appropriate size cassettes in room.

  i) If there is insufficient supply of cassettes, arranges to obtain or decides to obtain personally.
  ii) Performer prepares for identification of the spotfilm cassettes as for overhead films.
  iii) Performer may use controls or manually pull out spotfilm bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position.
  iv) If R-L markers are to be used with spotfilming, performer tapes into place on image intensifier screen.

j. If a grid will be used with the image intensifier for fluoroscopy and/or spotfilming, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

3. Performer preselects technical exposure factors for overheads, fluoroscopy and spotfilming, based on standards for infants set by the institution as appropriate for examination:

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a. Dons protective leaded rubber garments such as apron and gloves.
b. Makes sure that no one is in examination room or control room.
c. Performer reviews the technique chart(s) for the unit(s) to be used:

  i) Locates information for skull views involved. Takes note of the exposure factors to be used for overheads, fluoroscopy, and spot filming. Considers preferences of the radiologist involved.
  ii) Notes any newly posted changes in technical factors (to reflect accommodation to change in machine output or a policy decision). Converts factor(s).
  iii) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

d. In the control room performer makes sure that indicator light shows that x-ray generator is "warmed up" and ready for use. Makes sure that all circuits have been stabilized. If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.
e. As appropriate, performer sets x-ray generator mode selector(s) to fluoroscopic mode, and for use

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of spot film camera or cassette device, and overhead filming.

f. Performer sets controls on image intensifier for spot film camera or cassette device:

   i) For spot film camera, performer selects and sets the rate (frames per second) for the camera according to standards set for infant examination.
   ii) For cassette spot filming performer may select and set a standard spot film program providing for format combinations such as single,half, or quarter combinations on a single cassette and related spot film sizes. Selects program appropriate for examination or awaits orders from radiologist.

g. If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

h. If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

i. Performer selects and sets exposure factors for fluoroscopy:

   i) Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination.
   ii) If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved.

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   iii) Sets fluoroscopic examination timer to maximum position.

j. If appropriate, performer selects and sets exposure factors for spot filming:

   i) For conventional manual exposure control, performer selects and sets the appropriate spot film time for the examination.
   ii) For automatic, phototimed exposure control, performer selects a density exposure control appropriate for the examination.
   iii) Performer selects the appropriate mA for the examination and the focal spot size to be used.
   iv) Performer selects and sets kVp by combining settings on one major and one minor kVp selector as appropriate for the examination.

4. If not already done, performer may set up and check x-ray and fluoroscope tube(s), image intensifier, collimator and accessories as appropriate prior to examination:

   a. Makes sure that no one is in room.
   b. Places phantom or appropriate test object on radiography table where patient's head will be centered for examination.
   c. Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.
   d. If not already done, moves image intensifier and any spot film device into position; centers (over or under) the area of interest.

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e. Performer adjusts the x-ray tube to appropriate focal spot/object distance (target to skin distance, TOD). For fluoroscopy adjusts distance between focal spot and image intensifier (focal spot to film distance, FFD). Makes sure that TOD is 15 inches or more. Operates controls or manually moves the x-ray tube(s) into place. Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD is obtained.

f. Performer collimates fluoroscopy tube (and x-ray tube used for spot filming if different), depending on nature of the equipment and controls:

  i) Adjusts fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or sets shutter mode selector to automatic collimation.
  ii) Manually sets collimator for the spot film field size to be used, or selects and sets field size control to be used for automatic collimation with programmed spot film cassette exposure sequence.

g. To check fluoroscopy mode, performer enters remote control room or operates controls in examination room behind leaded screen:

  i) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.
  ii) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.
  iii) Checks mA meter and notes whether appropriate reading is obtained.
  iv) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.
  v) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

h. To check spot film functioning performer may move cassette or roll film into x-ray exposure field using appropriate controls:

  i) Performer activates controls for spot film exposure. Notes whether cassette or roll film transport is operating appropriately. Notes whether exposure is terminated by phototimer or, if manual timer, in time set. If appropriate, releases spot film control after exposure.
  ii) If equipment is operating appropriately, performer unloads cassette, reloads or advances roll film as appropriate. Moves bucky tray out of way until fluoroscopy is completed.

i. After equipment has been checked performer shuts and resets for standard exposure factors. If performer decides that any of the fluoroscopic equipment is not functioning properly, performer informs appropriate staff member.

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5. Depending on institutional procedures performer may bring requisition sheet and patient's chart to radiologist; may bring patient and accompanying adult and/or staff member to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready.

   a. If performer is to have patient readied in examination room, may proceed as follows:

      i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. Dons gown, mask, gloves.

      ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.

      iii) Performer greets any accompanying staff person and/or parent or guardian and introduces self. Checks patient's identity against the requisition sheet. With inpatient, checks hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

      iv) If not already done, performer places padding on x-ray table. May have nurse carefully place patient in supine position on table, or lifts patient carefully, supporting infant's head, and places on table.

      v) If patient has a life support system in place, such as oropharyngeal tube, makes sure equipment is being monitored. Makes sure patient is being attended and there is no danger patient will fall off table.

   b. Performer may inform attending radiologist that patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films to radiologist.

      i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

      ii) Performer may accompany radiologist to examination room.

   c. If not already done, performer joins radiologist and anesthesiologist in examination room. May provide radiologist with protective lead garments and sterile gown, mask and gloves.

      i) During radiologist's review of requisition, prior films and examination of patient, performer notes radiologist's orders. May assist while radiologist tests clinically for choanal atresia.

      ii) If radiologist decides to cancel procedure, performer may arrange to terminate and reschedule as appropriate, have forms filled out.

      iii) If radiologist will proceed, performer provides patient, radiologist, anesthesiologist,

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and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member, parent, or guardian will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

6. Performer notes radiologist's orders for unilateral or bilateral scout films prior to fluoroscopic examination.

   a. May use centimeter calipers to measure the thickness of the patient's skull in the direction in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors for overheads.
   b. Performer may question radiologist on what patient movement is possible, to determine what positions are available for use and what immobilization techniques are appropriate.
   c. Performer may have patient's body immobilized with extremities at sides by mummying (wrapping), or may decide to do personally. If performer asks co-worker or nurse to do, indicates at what level sheet should be wrapped. May explain or demonstrate to staff member what is required for immobilizing the patient.
   d. After making sure that patient is being attended, performer sets up equipment for the scout film(s) before positioning and immobilizing patient:

      i) Performer obtains the appropriate size loaded cassette for the

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first (or next) scout projection and attaches identification information to the cassette or table top:

Places right or left marker on cassette or table top as appropriate to the study and projection or depresses appropriate R or L button for automatic marking.
If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.
If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
Performer may place patient's card into card tray for equipment using automatic film marking device.

      ii) With neonate, performer may wrap prepared cassette with plastic wrap before positioning cassette. Places wrapped cassette in position in vertical holder at right angles to table top.

   e. Sets or resets technical exposure factors as appropriate for overheads:

      i) Enters control room and sets controls for radiography mode.
      ii) Performer selects milliamperage and chooses selectors for the correct focal spot size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of

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major kilovoltage and minor kilovoltage settings to produce the desired kVp.

iii) Depending on the equipment, may set controls to provide for use of manual tableside adjustment of table and tube height, position, and collimator.

iv) Performer may set the focal-film distance (if not already done). Operates controls or manually moves the x-ray tube into place at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

f. Performer prepares the patient in the position selected for the first (or next) lateral preliminary exposure:

i) May explain or demonstrate to nurse what is required for immobilizing and positioning. May obtain help. In positioning and immobilizing patient, performer remains alert to patient's respiration. Does not force infant into a position where any breathing difficulty increases. Does not force flexion of the neck.

ii) Performer places patient or has patient placed in supine position. Uses horizontal beam for lateral projections of the skull.

iii) Supports patient's head so that the median sagittal plane is vertical. Adjusts cassette placed vertically in holder so that it is in contact with head on side of interest. Supports. Positions head so that a coronal plane just below the external auditory meatus is centered to the midline of film. Has median sagittal plane of the head parallel with the plane of the film. Checks that the interpupillary line is at right angles to the plane of the film, using a right angled object or protractor. Centers cassette at the level of the nasopharynx (just below the level of the external auditory meatuses).

Directs central ray to the area of interest at right angles to film and/or parallel to the interpupillary line.

iv) Performer may immobilize patient by use of head clamp. Places restraining bands as appropriate using additional strips of gauze and adhesive tape as appropriate.

May position head between two large sponges. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration, and other vital functions.

v) In checking angulation, performer measures angles between central ray and horizontal reference point in relation to reference line on patient's skull, such as interpupillary line.

vi) Performer checks final positioning using protractor and light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size (or the size of the unshielded area of the film to be exposed). Uses cross-hair shadows as reference

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for center of field. Uses the collimator light to center the part to the x-ray field or centers the part to the film holder and uses the collimator light to center the tube to the part. Rechecks angulation of head and central ray. Checks that the primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired.

vii) If appropriate, performer may tape a metal ruler into place so that it will be exposed along with the patient's skull.

viii) Once the patient has been positioned and immobilized, performer adjusts the collimator. Collimates so that a small unexposed border will appear around the edge of the film, and collimates further so as to expose only the area of interest (and thus provide maximum protection and detail). May use extension cone (in direct contact with head when appropriate for immobilization) for collimation to the minimum size needed to cover the area of interest.

ix) If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.

x) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

g. Performer makes first (or next) scout exposure:

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i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted. Returns to control panel and checks that controls are properly set and patient is still in position.

ii) Performer observes patient's breathing and times exposure to the appropriate instant for the phase required. Starts exposure for deep inspiration at the peak elevation of inspiration. Starts exposure for expiration after phase has begun.

iii) Performer initiates exposure by pressing hand trigger or exposure control button.

iv) While exposure is underway, performer checks that mA meter records appropriate current as set, that kVp meter dips slightly. May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.

v) After exposure is completed tells any adult with infant that he or she can relax. Removes cassette from cassette holder or table. Removes any markers for further use.

vi) For bilateral views reverses positioning and sets up equipment for opposite-side lateral view as described, without repositioning patient. Makes exposure as described.

h. Performer arranges to have the scout exposure(s) processed at once or decides to do personally.

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- i) Attaches ID card for use with flasher if appropriate. May sign requisition.
- ii) While film(s) are being processed, makes sure that patient is comfortable and, if necessary, attended by radiologist, staff member, or self.

i. When the scout film(s) have been processed, performer brings the processed radiograph(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist that the radiograph(s) are ready.

- i) If the radiologist indicates that there is any problem with the technical factors, processing, or patient positioning, performer records or notes for later use in the examination and/or repeats preliminary radiography as ordered.
- ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

7. During and/or after radiologist's review of scout films of patient, performer makes note of radiologist's decisions and orders and proceeds as appropriate:

   a. If radiologist decides to cancel procedure, performer arranges to terminate and reschedule as appropriate.
   b. If radiologist will proceed, notes radiologist's final orders on sequence of examination and use of contrast. May discuss sequence and timing of procedure with radiologist. May arrange signals for exposure, changing of spot film cassettes, operation of exposure controls. Notes radiologist's orders for program and settings for spot filming. Notes whether a bilateral study will be done.
   c. Performer arranges to provide any equipment or materials not already present or decides to do personally. Once contrast medium has been selected, performer checks that it is available in syringe or decides to prepare personally. If required, changes or adjusts technical factors, program, and settings for fluoroscopy, spot filming.
   d. For overheads, performer notes needed adjustment of technical factors from those used for scout film(s) to allow for any changes requested by radiologist in technique or positions, and/or allows for use of contrast medium.

8. Performer assists radiologist with instillation of contrast, fluoroscopy and spot filming:

   a. May help position patient as appropriate.
   b. If not already done, gives leaded gloves and apron to radiologist. If appropriate, places leaded curtain in place. Checks that patient and everyone remaining in room is appropriately shielded.
   c. Washes hands as appropriate. May assist while radiologist inserts a nasopharyngeal tube into one nostril. May assist with instillation of contrast.

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d. On signal from radiologist, performer may dim room lights. Turns on TV power switch. May go to control room,and operates fluoroscope and spot film controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders.

e. Performer may operate tilt table on orders from radiologist, or assist in positioning patient as ordered.

f. Performer may assist with spot filming:

  i) Operates exposure controls as ordered or positions table, tube, or patient as ordered.
  ii) If spot film attachment uses cassettes, performer may unload as used, identify and insert additional cassettes, as described above, throughout procedure.
  iii) Depending on institutional procedures, performer may keep radiologist informed of cumulative exposure as shown on fluoroscope timer indicator.

g. After spot filming is completed, or when ordered by radiologist, performer arranges to have spot films processed;

  i) May sign or have radiologist sign requisition sheet.
  ii) Checks that equipment is turned off.
  iii) With cassette spot films,removes any markers for further use. Attaches ID card for use with flasher if appropriate.
  iv) With spot film camera, performer advances the film so that all exposures made will be wound on the take-up spool in the roll film cassette. May replace dark slide on camera lens. Uses device to cut film and create a light shield. Resets counter and removes film cassette.
  v) Performer arranges to have spot films processed at once if appropriate or decides to process personally.
  While films are being processed, makes sure that patient is comfortable and is being attended by radiologist, staff member, or self.
  vi) Performer brings the processed spot films directly to the radiologist or places on view boxes and informs radiologist that they are ready. May hang prior films and scouts.
  vii) Changes technical factors as ordered and assists with any continued fluoroscopy and spot filming as described until radiologist indicates fluoroscopic examination for that side is completed.

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h. When the radiologist informs performer that the fluoroscopic portion of the examination (for the given side) is over, performer notes any orders for immediate overhead filming.

  i) If an overhead film is ordered, repeats radiography for exposure ordered by radiologist, adjusting technical factors, tube, and position of patient or cassette holder as appropriate. Repeats setting of radiography mode,identification of film,positioning,collimation, shielding, placement of metal ruler and exposure as for scout, taking note of any changes re-

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quired due to presence of contrast or radiologist's orders.

- ii) Has exposed film processed at once.
- iii) Performer brings the processed radiograph directly to the radiologist in charge or places on view box and informs radiologist that it is ready. May hang prior films, spots and scouts.
- iv) Performer notes any order for repeat of any part of radiographic examination.
- v) Repeats appropriate steps as described above until radiologist indicates that examination for that side is completed.

9. Throughout procedure performer observes patient for any signs of emergency and/or to prevent or respond to an accident. Is alert to signs suggesting any impairment in patient's respiration. Notifies anesthesiologist or physician at once if patient shows emergency signs.

10. When radiography is completed for first side, performer stands by and/or assists while radiologist removes the opaque medium from the choana using saline in syringe.
    - a. If bilateral study will be done, performer repeats the steps as appropriate for instillation, fluoroscopy, spot filming, overhead filming,and removal of contrast from the other side as described.
    - b. Performer brings the full set of radiographs to radiologist when the examination is completed so that a diagnosis and any measurements can be made.

11. When performer is sure that the examination has been completed, carries out termination steps for the examination:

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- a. Performer may have patient cleansed, fed, transported back to room, to parent or guardian, or to next location, or decides to do personally, as ordered. Makes sure that patient is in the care of a staff person who will transport to appropriate next location or, if out-patient, will arrange to have patient taken home by parent or guardian as appropriate.
- b. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements.
- c. May present requisition form to radiologist for comments and signature.
- d. Performer records the examination according to institutional procedures. May include date, room, examination type, and overhead views taken, the technical factors used, and film sizes. Performer may record the number of exposures made of each overhead view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.
- e. May record the fluoroscopy examination including exposure time and rad dosage (using posted data).
- f. Performer may decide to jacket radiographs, requisition sheets, and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures.
- g. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

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1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. measured;films identified; technical factors selected and set for fluoroscopy, spot filming,overheads;scouts taken;radiologist assisted with fluoroscopy,spot filming,with sterile technique;overhead exposures made;radiographs sent for processing,review;procedures repeated as ordered and/or for other side;examination recorded;bronchograms placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, technical history,prior radiographs;phone;view boxes; pen;x-ray generator,control panels,tube,bucky,table, collimator;fluoroscopy unit,image intensifier,spot film device,TV monitor;vertical film holder;film tunnel;cassettes;roll film;R-L,ID markers;sterile procedure tray;emergency cart;contrast media and heater; plastic wrap;sterile gown,gloves,mask;lead shielding; immobilization devices,head clamp, band,tape,gauze, pillowcase,stockinet;calipers;technique,standard view,tube rating and rad exposure charts;calipers; phantom or test object;intercom;order forms;filter

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. **If "Yes" to q. 3:** Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Pediatric pt.;radiologist;attending pediatrician;anesthesiologist;surgeon;co-worker;nurse

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking bronchograms of a pediatric pt.,by reviewing request;preparing equipment;following sterile technique;measuring patient;setting up for fluoroscopy and spot filming;setting technical factors;identifying films;providing shielding;collimating;taking scout films as ordered;assisting with fluoroscopy, spot filming;taking overhead bronchograms as ordered;arranging for processing;taking to radiologist; continuing,repeating as ordered for second side; placing bronchograms for use;recording.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate technical history for pediatric patient scheduled for bronchography (radiographic examination of the lung(s) and bronchi after instillation of contrast medium in bronchus) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

    a. Performer checks the examination called for and the purpose. Notes the procedure room assigned and its location (such as on operating room floor or in diagnostic radiography department). Checks the time for the scheduled procedure, and, if (or as) appropriate, the time to report for preliminary preparations and/or any request for a scout film prior to intubation.
    b. Notes name of attending radiologist, pediatrician,

OK-RP;RR;RR

6. Check here if this is a master sheet..(x)

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anesthesiologist and/or charge nurse or supervisor.

c. Performer reads patient's name, identification number, sex, age, weight, and height. Notes any special information or note on known pathology that could affect patient positioning, technique, or handling. Notes any prior history of allergic reaction to contrast or allergies.

d. Performer notes whether fluoroscopy will be combined with spot filming and overhead radiography. Notes whether the use of a grid or bucky will be involved.

e. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, and the examination. Plans to take special precautions such as use of gown, gloves, mask, isolation procedures to protect patient from contamination or to prevent spread of infection. Notes appropriate shielding for examination.

f. If patient's record indicates orders for postural drainage or any prior medication, performer may check that these were administered and properly timed. If not already done as appropriate, may arrange to have orders carried out or informs appropriate staff member.

g. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

   i) Depending on institutional procedures, performer may note whether the examination has been done at the institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention.

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   ii) If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to select technique or prepare for examination, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

h. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

i. Performer determines what prior preparations will be needed, such as provision of accessories, proper dress, cooperation with procedure room staff:

   i) Performer may contact staff to receive more detailed orders, information, or to check on safety, timing or availability of equipment.

   ii) Performer checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.

   iii) Performer may note whether film processing equipment is available adjacent to procedure room. If films must be processed at a distance from procedure, performer may make sure that someone is assigned to pick up, process,

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and return radiographs to procedure room as they are processed.

2. At appropriate time, performer goes to procedure room to prepare equipment and materials for the procedure:
   a. Performer may report to the charge nurse or supervisor. Checks name of patient. Asks about specific precautions in dealing with patient.
   b. Performer may make sure that unit to be used has an adequate output for the required radiography and is hazard-proof for use near general anesthesia equipment. May check for proper filter in x-ray tube, fractional focal spot size, whether light beam in collimator is hazard-proof or not to be used. May check whether a Potter-Bucky diaphragm or grid-front cassettes and a cassette tunnel will be used. Checks whether use of bucky is compatible with safety requirements. If appropriate checks that image intensifier fluoroscopy equipment is available.
   c. Performer may receive a clean hospital gown, cotton "boots," cap and mask. Performer dons these before entering sterile area. Washes hands as and when appropriate. Carries out appropriate steps to maintain the integrity of the sterile area of the procedure room and does not touch patient, drapes, physicians, nurses, instrument tables or "back table."
   d. Performer may report to anesthesia area of room to discuss appropriate timing of scout film and/or presence of any explosive gases.
   e. Performer may discuss placement of cassette tunnels or grids with appropriate staff member (if not part of procedure table) so that they can be placed on table while prior preparations are being made. May give cassette tunnels to appropriate staff member and check that they are placed so that openings face the free end of the table while being part of sterile field, and that any vertical holder to be used is positioned properly.
   f. As appropriate, checks that sterile procedure tray for examination has been properly prepared or decides to prepare personally.
      i) Provides iodized oil and barium sulfate suspension contrast media if radiologist may be considering a choice due to possible allergic reaction. Checks that contrast media show no chemical deterioration.
      ii) Checks that heating apparatus is present for iodized oil, and arranges to heat to appropriate temperature.
      iii) Checks that cardiac monitoring equipment and emergency life support equipment are present.
   g. Checks that proper accessories for pediatric patient are available for procedure including leaded rubber shielding for patient, lead aprons and gloves to be used by anyone who will remain in the room during exposure.
      i) Checks that appropriate immobilization devices are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient.
      ii) Makes sure that right (R) and left (L) markers are available for use and identification cards, leaded numerals or markers.

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iii) If infant is to be positioned for erect projections, performer sets up footboard at end of x-ray table to hold patient.

h. For overhead filming performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes for pediatric patients are available in the examination room. Selects appropriate speed and type of film, grid, and cassette combination depending on the technique to be used and standard institutional practices. Selects size based on patient's size and area of interest. If adequate supply is not in room, arranges to obtain or decides to obtain personally.

i. Performer prepares for identification of overhead films using equipment provided by institution:

  i) May obtain lead numerals and tape and prepare identification strip for placement on cassettes giving appropriate patient identification information.
  ii) Performer may prepare for use of flashcard by checking that there is piece of lead on cassette surfaces; may write or type out ID information on card if not received with requisition.
  iii) Checks identification against requisition sheet.

j. If examination will include spot filming using a camera (attached to image intensifier) and roll film, performer checks film supply indicator to make sure that there is sufficient film in the roll film cassette.

  i) If there is insufficient roll film in camera, performer arranges to have roll film cassette loaded, or decides to do personally.
  ii) When loaded roll film cassette is obtained, performer checks loading in subdued light. Checks that end of film is cut correctly and is properly threaded and attached to take-up spool so that film unwinds appropriately. Checks that film is properly engaged on sprockets. Locks into operating position. If appropriate, cuts off excess film at exit port and removes. Attaches film cassette to camera and locks into place. Replaces camera cover.
  iii) If there is an adequate film supply, checks that film is properly loaded.
  iv) Performer advances film to compensate for any exposure of film due to installation or check.
  v) Removes dark slide from camera lens.
  vi) If not already done, performer writes or types a card with patient's identification information, for use with spot film device. Inserts in slot in spot film camera as appropriate.

k. If examination will include spot filming using a cassette/bucky spot film device, performer checks that there is an adequate supply of appropriate size cassettes in room.

  i) If there is insufficient supply of cassettes, arranges to obtain or decides to obtain personally.
  ii) Performer carries out identification of the spot film cassettes as for overhead films.

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iii) Performer may use controls or manually pull out spot film bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position.

iv) If R-L markers are to be used with spotfilming, performer tapes into place on image intensifier screen or plans to tape to patient's body.

1. If a grid will be used with the image intensifier for fluoroscopy and/or spot filming, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

3. Performer sets up technical equipment:

   a. Dons protective leaded rubber garments such as apron and gloves.
   b. Makes sure that no one is in examination room or control room.
   c. Performer reviews the technique chart(s) for the unit(s) to be used:

      i) Locates information for the pediatric chest views involved. Takes note of the exposure factors to be used for overheads, fluoroscopy, and spot filming. Considers preferences of the radiologist involved, conversions needed to account for patient's age, condition, any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).
      ii) Performer looks up numerical conversion factors and calculates or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.
      iii) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

   d. At the control panel, performer makes sure that indicator light shows that x-ray generator is "warmed up" and ready for use. Makes sure that all circuits have been stabilized. If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.
   e. As appropriate, performer sets x-ray generator mode selector(s) to fluoroscopic mode and for use of spot film camera or cassette device, or overhead filming if scout films will be taken first.
   f. Performer sets controls on image intensifier for spot film camera or cassette device:

      i) For spot film camera, performer selects and sets the rate (frames per second) for the camera according to standards set for examination.

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  - ii) For cassette spot filming performer may select and set a standard spot film program providing for format combinations such as single, half, or quarter combinations on a single cassette and related spot film sizes. Selects program appropriate for examination or awaits orders from radiologist.

g. If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

h. If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

i. Performer selects and sets exposure factors for fluoroscopy:

  - i) Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination.
  - ii) If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved.
  - iii) Sets fluoroscopic examination timer to maximum position.

j. If appropriate, performer selects and sets exposure factors for spot filming:

  - i) For conventional manual exposure control, performer selects and sets the appropriate spot film time for the examination.
  - ii) For automatic, phototimed exposure control, performer selects a density exposure control appropriate for the examination.
  - iii) Performer selects the appropriate mA for the examination and the focal spot size to be used.
  - iv) Performer selects and sets kVp by combining settings on one major and one minor kVp selector as appropriate for the examination.

k. Performer may set up x-ray and fluoroscope tube(s), image intensifier, collimator and accessories as appropriate for check of equipment prior to examination:

  - i) Makes sure that no one is in room.
  - ii) Places phantom or appropriate test object on radiography table where patient's area of interest will be centered for examination.
  - iii) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.
  - iv) If not already done, moves image intensifier and any spotfilm device into position; centers (over or under) the area of interest.
  - v) Performer adjusts the x-ray tube to appropriate focal spot object distance (target to skin distance, TOD). For fluoroscopy adjusts distance between focal spot and image intensifier (focal spot to film distance, FFD). Makes sure that TOD is 15 inches or more. Operates controls or manually

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moves the x-ray tube(s) into place. Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD is obtained.

vi) Performer collimates fluoroscopy tube (and x-ray tube used for spot filming if different), depending on nature of the equipment and controls.
Adjusts fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or sets shutter mode selector to automatic collimation. Manually sets collimator for the spot film field size to be used, or selects and sets field size control to be used for automatic collimation with programmed spot film cassette exposure sequence.

vii) If appropriate, performer attaches or sets up footboard at end of tilt-table; may adjust or attach shoulder rest, hand grips, compression band.

l. If not already done, performer checks functioning of fluoroscopy equipment by entering remote control room or operating controls in examination room behind leaded screens. Performer turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.

i) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.

ii) Checks mA meter and notes whether appropriate reading is obtained.

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iii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.

iv) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

m. To check spot film functioning, performer may move cassette or roll film into x-ray exposure field using appropriate controls.

i) Performer activates controls for spot film exposure. Notes whether cassette or roll film transport is operating appropriately. Notes whether exposure is terminated by phototimer or, if manual timer, in time set. If appropriate, releases spot film control after exposure.

ii) If equipment is operating appropriately, performer unloads cassette and reloads or advances roll film as appropriate. Moves bucky tray out of way until fluoroscopy is completed.

n. After equipment has been checked, performer shuts and resets for standard exposure factors. If performer decides that any of the fluoroscopic equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

o. Performer may preselect and set the exposure factors for the first scout film:

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i) Locates the information needed for the pediatric chest projection involved according to the anticipated thickness of the part and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed, focal spot size, FFD and use or nonuse of other accessories (such as screens, grids, bucky, etc.).

ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.

iii) Performer sets exposure factors as selected. Checks that controls are set for radiography mode.

iv) For conventional exposure control, performer selects milliamperage and chooses selectors for the correct focal spot size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

v) For automatic phototimed exposure control, performer selects and sets the category corresponding to the type of study and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming). May select and set a kVp range button (if called for with the equipment) corresponding to the range for the examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

vi) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustment of table and tube height, position, and collimator (unless these have already been set).

vii) Performer may return to overhead unit and set the focal-film distance (if not already done). Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD is obtained.

4. When ready, performer indicates to appropriate staff member that equipment has been set up, and/or performer joins the team of radiologist, pediatrician, anesthesiologist, surgeon, co-worker, and nurse as determined by institutional arrangements.

   a. If appropriate, determines who will be assigned to monitor patient's vital signs, EKG. Performer may discuss coordination of respiration and overhead filming with anesthesiologist and radiologist.
   b. Performer awaits radiologist's orders for preliminary scout film(s), the patient position(s) and phase of respiration (usually end of full inspiration). Notes whether scout film(s) will be taken before and/or after patient is intubated. Notes whether bilateral scouts are ordered.

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i) Performer may question radiologist on what movement is possible to determine what positions are available for use. Notes whether patient will be examined in standard positions with the projections ordered; if not, may suggest alternative positions.

ii) If performer will measure child before he or she is intubated, performer greets patient in appropriate location.
Performer attempts to calm child and gain cooperation by communicating as appropriate to patient's age. Is as calm and gentle as possible. May explain the need to measure patient for radiography.

iii) Unless measurements have already been made or are not necessary, performer uses centimeter calipers to measure the thickness of the chest in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining final exposure factors. If appropriate, resets exposure factors for first scout film as described.

iv) Performer provides patient and everyone who will remain in room during exposure with appropriate protective shielding. If staff members will be asked to assist in positioning and immobilization, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

5. When appropriate, performer arranges to take preliminary scout film(s) of the patient's chest:

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a. Performer obtains the appropriate size loaded cassette for the first (or next) projection and position:

i) May mark midpoint of (each) cassette (or each half of a cassette to be used for separate bilateral views). Uses radiolucent marker.

ii) If bilateral exposures will be made separately on one film, performer mentally decides how these will be positioned so that the film need not be turned for viewing each image. Performer uses leaded rubber sheets and masks the cassette completely except for the half to be exposed. Treats the half to be exposed from this point as though it were the actual film size.

iii) Places right or left marker on cassette or table top as appropriate to the projection or depresses appropriate R or L button for automatic marking.

iv) If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.
If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
Performer may place patient's card into card tray for equipment using automatic film marking device.

v) Performer may wrap prepared cassette with plastic wrap before positioning cassette. Places wrapped cassette in location

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appropriate for filming (in preparation for placement of patient on cassette).

- vi) If a bucky is not being used, performer places film holder in a position approximating final positioning such as on table or in film tunnel. As appropriate, performer may place cassette in vertical holder at right angles to table top.
- vii) If cassette is to be used with bucky (under table top or in upright holder) performer may manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.
- viii) If patient has already been draped, performer has nurse or someone who is part of sterile team lift the drape to expose opening of bucky or cassette tunnel and replace drape after cassette is placed.

b. Performer prepares the patient in the position selected for the first (or next) scout exposure unless this is done by physician:

- i) May explain or demonstrate to staff member what is required for immobilizing and positioning. May obtain or provide help.
- ii) In positioning and immobilizing patient, places patient in supine and/or lateral recumbent position unless otherwise requested (such as for erect views). Plans to use horizontal beam for lateral projections, with patient supine. In positioning head for AP projection, performer keeps median sagittal plane vertical to avoid rotation of thorax.

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- iii) Performer arranges patient in position or indicates to staff member what to do. May immobilize patient's arms by extending them and placing them along sides of head, next to the ears.

  May apply a sleeve made of a diaper, towel, pillowcase, or orthopedic stockinet to hold arms in position. Puts this over arms so that sleeve holds arms above and behind head, one at each side.

  May apply a sleeve of stretch gauze or bandage to the legs and pelvis. Wraps lightly to maintain patient in position.
- iv) Performer centers chest area and keeps the long axis parallel to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part. With upright holder, adjusts height of holder to part and centers part to film.

c. For a supine AP projection (posterior view) of the pediatric chest, performer centers child in supine position on cassette or table or has this done.

- i) If high kV technique is being used only for AP projection, performer inserts appropriate filter in x-ray tube and removes after exposure.
- ii) Has patient's arms immobilized above and behind head next to ears as described; has lower legs immobilized as described,

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or tapes legs together just above knees.

iii) Adjusts patient so that median sagittal plane of body and head are centered to midline of cassette. Gently extends head and neck and immobilizes with head clamp, webbing strap under chin, or sponges so that median sagittal plane of head is at right angles to cassette. May elevate patient's knees and place restraining band across legs.

vi) Directs central ray at right angles to film, centered to the sternal angle. If patient's neck cannot be extended, may direct central ray 5° to 10° cephalad.

d. For a lateral projection of the pediatric chest, performer notes side of interest and whether patient is to be positioned in a true lateral recumbent position or is to remain supine with tube directed horizontally across table to cassette placed vertically.

i) If high kV technique has been used for AP projection, may remove special filter for lateral projection.

ii) For lateral positioning, performer immobilizes patient's upper and lower extremities as described, and turns patient on to the side of interest or has this done. Cushions neck, chin, and head, and keeps cheek level with the cassette. Uses tape, restraining bands, or diaper across table to support and hold patient in position. Directs central ray vertically at right angles to film, centered to the fourth thoracic vertebra.

iii) For supine positioning for lateral projection, performer maintains patient in supine position as described. May elevate on radiolucent sponge or pad. Positions grid cassette or grid holder vertically on table on side of interest. Supports so that x-ray beam may be directed horizontally at right angles to film. May place wedge shaped pads or radiolucent sponges beneath neck; checks that head is in true AP position. Centers cassette to the mid-axillary line of the body at the level of the center or area of interest. Directs central ray at right angles to film to midpoint of area of interest.

e. For oblique projection of the pediatric chest, performer notes whether left and/or right views are ordered. Notes whether patient is to be positioned from the AP supine position. If so, substitutes left AP oblique for right PA oblique projection, and right AP oblique for left PA oblique projection.

i) Adjusts and centers patient in PA prone or AP supine position on table as ordered, and elevates thorax. Immobilizes patient's arms above head.

ii) Performer elevates and supports the side opposite the side of interest on radiolucent sponge blocks or towels so that the shoulder and chest on the side of interest are in contact with cassette or table at the angle indicated. Supports and immobilizes as described.

iii) Directs central ray at right angles to film through the cen-

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ter of area of interest such as at the level of the fourth thoracic vertebra.

f. If not yet completed, performer immobilizes patient in position. Places restraining bands, strips of gauze, and adhesive tape as needed. May use head clamp. Avoids use of compression band across abdomen or chest. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

g. Performer may check final positioning by using light in collimator. (Does not use light beam in procedure room unless it has been certified as safe for use in presence of explosive gases.) Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size (or the size of the unshielded area of the film to be exposed). Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the patient to the x-ray field, or centers the part to the film holder and uses the collimator light to center the tube to the part. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube position to provide better centering.

h. Performer provides appropriate collimation and shielding:

   i) Once the patient has been positioned and immobilized, performer adjusts the collimator so that a small unexposed border

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will appear around the edge of the film; collimates further so as to expose only the area of interest (and thus provide maximum protection and detail). May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the part(s) of interest.

   ii) If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.

   iii) Makes sure that anyone holding the patient (if absolutely necessary) or remaining in room is supplied with lead gloves and apron and stays out of central beam as much as possible.

   iv) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

i. When everything is ready for the exposure, performer prepares for control of respiration movement during exposure:

   i) With child, explains how to take a deep breath and hold when asked to by performer. May practice with child.

   ii) With infant, observes patient's breathing and plans exposure for the peak elevation of the chest just before the chest comes to rest at the end of an expansion.

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j. Performer makes first (or next) scout exposure:

- i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted. Returns to control panel and checks that controls are properly set and patient is still in position.
- ii) As rehearsed, tells child when to take a deep breath and hold by calling or using intercom; or observes infant's breathing and times exposure to the peak elevation of inspiration.
- iii) Performer initiates exposure by pressing hand trigger or exposure control button.
- iv) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly. May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
- v) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cutoff, or overexposure due to faulty timer).
- vi) After exposure is completed, tells child or any adult with infant that he or she can relax.
- vii) After exposure performer returns to patient. If patient has been draped, has surgical drape raised to expose cassette holder.

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Removes cassette from holder, table, bucky or film tunnel. Removes any markers for further use. If bilateral views are to be made on the film, removes leaded rubber mask and remasks the other side to be exposed.

k. Performer repeats radiography steps for all preliminary exposures ordered before review by radiologist, adjusting technical factors, tube, and position of patient or film holder as appropriate to each view ordered. For bilateral studies reverses side of interest and repeats for other side.

l. Performer arranges to have the scout exposure(s) processed at once.

- i) If there is no processing equipment adjacent to procedure room, performer gives cassette to co-worker for processing.
- ii) If there is a darkroom with processing equipment next to procedure room, performer arranges to have cassette processed at once or decides to do personally.
- iii) Attaches ID card for use with flasher if appropriate. May sign requisition.

m. Performer has the processed scout films reviewed as soon as they are processed:

- i) Performer brings the processed radiograph(s) directly to the radiologist and other physicians in charge, places on view boxes, and/or arranges to

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have viewed in darkroom; informs radiologist and physicians that the radiographs are ready. May display prior films.

ii) If the radiologist indicates that there is any problem with the technical factors, processing, or patient positioning, performer records or notes for later use in the examination, and/or repeats preliminary radiography as ordered.

iii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density of contrast, and adjusts as appropriate to avoid any need for future "retakes."

6. During radiologist's and other physicians' review of scouts, prior films and examination of patient, performer notes orders for any changes in patient positioning, technical factors and/or overhead views. Notes radiologist's final choice of contrast (depending on allergies) and any other orders. Discusses sequence and timing for procedure. May arrange signals for exposure, changing of spot film cassettes, operation of exposure controls. For bilateral study notes which side will be examined first.

   a. If physicians decide to cancel procedure, performer may arrange to terminate and reschedule as appropriate.
   b. Performer arranges to provide or change any equipment or supplies as ordered.
   c. Once contrast medium has been selected, performer checks and may help prepare in syringes. Shakes and places iodized oil in appro-

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priate heating device; checks that contrast medium is maintained at appropriate body temperature until ready for use.

   d. Performer changes or adjusts technical factors, program, and settings as ordered or as appropriate for fluoroscopy and spot filming.
   e. For overhead radiographs, performer notes needed adjustment of technical factors from those used for scout film(s) to allow for use of contrast material and any changes requested by radiologist.

7. Performer stands by or proceeds with technical preparations while patient is intubated, anesthetized, and instillation of contrast is begun.

   a. Follows sterile procedures.
   b. If appropriate, places leaded curtain in place in preparation for fluoroscopy.
   c. Performer assists during fluoroscopic viewing of progress of positioning of endotracheal tube, catheter, and instillation of contrast on first side:

      i) On signal from radiologist, performer may dim room lights. Turns on TV power switch. May go to control room and operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders.
      ii) If spot film attachment uses cassettes, performer may unload as used, identify, and insert additional cassettes, as described above, throughout procedure.
      iii) Depending on institutional procedures, performer may keep radiologist informed of cumula-

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tive exposure as shown on fluoroscope timer indicator.

8. When the radiologist indicates that the given side has been sufficiently observed under fluoroscopy and sufficient spot films have been taken, performer proceeds with overhead filming of the bronchi on the side of interest as ordered:

   a. Performer coordinates with anesthesiologist and has patient positioned in same positions ordered for scout films unless otherwise ordered.
   b. Plans for lateral projection only for first side if both sides are to be opacified.
   c. Performer repeats identification and placement of cassette, x-ray tube; has patient positioned as described.
   d. Performer arranges to make exposure on signal from anesthesiologist that respiratory arrest has been induced at end of inspiration. After exposure is completed indicates to anesthesiologist that respiration can be resumed.
   e. After spot filming and overhead filming is completed for first side, or when ordered by radiologist, performer prepares to have spot films and overhead bronchograms processed:

      i) May sign or have radiologist sign requisition sheet.
      ii) Checks that equipment is turned off.
      iii) With cassette spot films or overhead exposures, removes any markers for further use. Attaches ID card for use with flasher if appropriate.
      iv) With spot film camera, performer advances the film so that all exposures made will be wound on the take-up spool in the roll film cassette. Replaces dark slide on camera lens. Uses device to cut film and create a light shield. Resets counter and removes film cassette.
      v) Performer arranges to have spot films and overheads processed at once as described.

9. Performer brings the processed spot films and radiographs of first side directly to the radiologist and physicians in charge or places on view boxes and indicates that they are ready. May hang prior films and scouts.

   a. Makes note of radiologist's decisions regarding adequacy of the bronchograms:

      i) If radiologist decides to inject more contrast medium, performer assists as above with fluoroscopy and spot filming. Repeats additional overhead bronchography as ordered.
      ii) If the radiologist indicates that there is any problem with the technical factors or the patient positioning for overheads, performer records or notes for use in "retakes" as described.
      iii) If radiologist requires additional views and/or positions, performer repeats overhead filming as appropriate to new projections, as described above.
      iv) For further overhead exposures performer repeats appropriate steps including identification of cassette, use of R-L marker, selection and setting of technique, having patient positioned, and positioning equipment for focus-object-film alignment,

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collimation, shielding, breath control, making exposure, and processing, as described above.

v) Performer shows subsequent sets of spot films and bronchograms of first side to radiolgist and physicians as processed, and proceeds as described above until radiologist indicates that examination of first side is completed.

b. Performer makes note of radiologist's decision regarding study of the other side:

i) If radiologist decides to examine the other bronchus at once, performer assists with fluoroscopy while contrast is removed from the first side.

ii) Assists as described above with instillation, fluoroscopy and spot filming of second side. Repeats overhead filming for second side as ordered; has bronchograms processed and continues until radiologist indicates that examination of second side is completed. Assists with removal of contrast from second side.

iii) If radiologist decides to examine the other bronchus at a later time, performer may have radiologist fill out requisition sheet. May arrange for scheduling.

c. After being informed that the bronchography is completed, performer makes note of radiologist's orders for delayed films after an appropriate elapse of time.

10. When so ordered, performer carries out termination steps while patient is cared for by medical team:

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a. May present requisition form to radiologist for comments and signature. May present forms for requisitions for later delayed films and/or additional examination.

b. Performer records the examination according to institutional procedures. May include date, room, examination type, the overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each spot film and overhead view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.

c. Performer may record the fluoroscopy examination including exposure time and rad dosage.

d. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements.

e. Performer may decide to jacket radiographs, requisition sheets, and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures.

f. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

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1. **What is the output of this task? (Be sure this is broad enough to be repeatable.)**

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected and set for fluoroscopy,spot filming,cine,overheads;scouts taken; radiologist assisted in administration of barium contrast,air contrast,positioning,fluoroscopy;overhead exposures made;radiographs sent for processing,taken to radiologist;procedures repeated as ordered;delayed series taken;pt. returned;examination recorded;radiographs placed for use.

2. **What is used in performing this task?** (Note if **only** certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, medical-technical history,prior films;view boxes;pen; x-ray generator,control panels,tube,bucky,table,collimator;fluoroscopy unit,image intensifier,spot film device,TV monitor;cassettes;roll film;cine camera, film;videotape device;extension cones;vertical cassette holder;filter;radiolucent board;stool;R-L,ID, series markers;sterile procedure tray,nasogastric tube,lubricant,feeding bottles,syringes;radiopaque liquid,paste or cream contrast;cup,spoon,straws,carbonated beverage;labeled test tubes;emergency cart; scissors;plastic wrap;gloves,gowns,masks;calipers; wax pen;forms;phone;immobilization devices,head clamp,band,tape,gauze,pillowcase,stockinet;diapers; padding;lead shielding;pacifier,toys;intercom; basin;technique,standard view,tube rating,rad exposure charts;phantom,test object;stretcher;incubator

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Pediatric pt.;radiologist;nurse;adult;co-worker

5. **Name the task so that the answers to questions 1-4 are reflected. Underline essential words.**

Taking upper GI radiographs of pediatric pt.,by reviewing request;preparing equipment;preparing,reassuring,measuring pt.;setting up for fluoroscopy,spot filming,video,cine;setting technical factors;identifying films;collimating;providing shielding;making scout film;assisting with administration of contrast, positioning of pt.,fluoroscopy,spot filming;taking overhead radiographs as ordered;arranging for processing;taking air contrast overheads of stomach,delayed film series as ordered;having pt. returned;placing radiographs for use;recording.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a pediatric patient scheduled for a radiographic contrast study of the esophagus, stomach, duodenum and/or small bowel (upper GI study) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior plain film (s) and/or prior contrast films.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:
    a. Performer checks the examination called for, the purpose and the areas involved. Notes whether a routine GI series is ordered, a study of individual organs, such as esophagus, stomach, duodenum and/or small bowel.
    b. Notes the name of the radiologist in charge; may

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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note the name of referring clinician.

c. Performer reads patient's name, identification number, sex, age (patients over four years have adult procedures), height and weight. Notes whether patient is in-patient, out-patient, or emergency patient.

d. Notes any orders on the type of contrast medium, such as barium sulfate mixture, ingredients, flavoring; whether iodized oil, air; notes whether contrast is to be administered by nasogastric intubation, drunk out of cup, or with straw.

e. Notes any special information that would affect patient positioning, technique, immobilization, or handling of the patient, such as presence of IV drip, oxygen supply, or similar life support devices; notes whether patient will arrive in incubator or on stretcher. Checks whether isolation technique is required for patient with communicable or infectious condition or neonate. Notes whether patient may be accompanied by nurse, other staff person, parent or guardian.

f. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, and the examination ordered.

   i) Plans to take special precautions with neonate or ill patient such as use of gown, mask, sanitary procedures to protect patient from contamination or to prevent spread of infection.
   ii) Notes appropriate shielding for examination.
   iii) Notes whether the use of a grid or bucky will be involved.
   iv) Notes whether fluoroscopy with videotaping, spot filming or

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cineradiography is planned, whether overheads will be taken.

g. If patient's record indicates orders for prior sedation, administration of medication, prior oral administration of contrast (for small bowel study), or period for withholding of food or fluid, performer may check that orders were carried out and with proper timing. If not carried out properly, may arrange to delay examination until orders are carried out, or informs appropriate staff member.

h. May note patient's feeding schedule and arrange to have patient fed while in department at appropriate point in the examination.

i. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

   i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention. Notes any record of technical factors used for prior films.
   ii) If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead

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with the procedure, performer brings this to attention of radiologist in charge. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

j. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary:

a. Washes hands as appropriate; depending on patient's condition, may arrange for or carry out isolation or decontamination techniques.

b. Checks that procedure tray for the examination has been properly prepared or decides to do personally.

i) If barium sulfate colloidal suspension(s) have been ordered and prepared, checks that consistencies and ingredients are appropriate for the study and patient's age. May check that cup, straws, spoon, lollipops, water are available.

ii) May check that a sterile nursing bottle and nipple with barium mixture has been ordered, prepared, and labeled, or arranges to order personally. When obtained, checks label to be sure proportions and ingredients of the mixture are appropriate for examination.

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iii) If appropriate, checks for sterile nasogastric tube and proper type of end hole.

iv) May check that label and container for gastric specimen is prepared or decides to do personally.

v) If stomach is area of interest, may prepare materials ahead that might be needed for air contrast if stomach, such as carbonated beverage, straw with hole in shaft, empty syringes, empty sterile feeding bottle.

c. Checks that emergency cart is present or available.

d. Checks that proper accessories are available for procedure including leaded rubber shielding, aprons, and gloves to be used by performer, radiologist, the patient, and/or anyone who will remain in the room during exposure.

i) Checks for gowns, masks, gloves to be worn if patient is neonate or is ill.

ii) Checks that appropriate immobilization devices for infant or child are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient.

iii) If infant is to be positioned for erect projections, performer may set up footboard at end of x-ray table to hold patient, may attach positioning ring, may check that there is radiolucent board available.

iv) Checks that clean pacifiers and toys are present.

e. May cover examination table with rubber sheeting and/or absorbant

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paper sheet. With neonate may arrange to have patient kept warm while on table.

f. Performer checks that technical equipment has grid or high speed bucky; may check that compression cone is in position or that pressure paddle is available for use.

g. Makes sure that right (R) and left (L) markers are available for use and identification cards or leaded numerals or markers.

h. For overhead filming, performer makes sure that an adequate supply of loaded cassettes are available in the examination room. Selects appropriate speed and type of film, grid, and cassette combination depending on whether a bucky or table top technique will be used and standard institutional practices. Selects size based on patient's size and area of interest. If adequate supply is not in room, arranges to obtain or decides to obtain personally. May obtain transparent plastic wrap for cassettes used on table top to protect patient from contact.

i. Performer prepares for identification of overhead films using equipment provided by institutution:

  i) May obtain lead numerals and tape and prepare identification strip for placement on cassettes giving appropriate patient identification information.
  ii) Performer may prepare for use of flashcard by checking that there is piece of lead on cassette surfaces; may write or type out ID information on card if not received with requisition.
  iii) Checks identification against requisition sheet.

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j. If examination will include spotfilming using a cassette/bucky spotfilm device, performer checks that there is an adequate supply of appropriate size cassettes in room.

  i) If there is insufficient supply of cassettes, arranges to obtain or decides to obtain personally.
  ii) Performer carries out identification of the spotfilm cassettes as for overhead films.
  iii) Performer may use controls or manually pull out spotfilm bucky tray and open retaining clamps. Inserts cassette into bucky tray and opens retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position.
  iv) If R-L markers are to be used with spotfilming, performer tapes into place on image intensifier screen or plans to tape to patient's body.

k. If examination will include spotfilming using a camera (attached to image intensifier) and roll film, performer checks film supply indicator to make sure that there is sufficient film in the roll film cassette.

  i) If there is insufficient roll film in camera, performer arranges to have roll film cassette loaded, or decides to do personally.
  ii) When loaded roll film cassette is obtained, performer checks

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loading in subdued light. Checks that end of film is cut correctly and is properly threaded and attached to take-up spool so that film unwinds appropriately. Checks that film is properly engaged in sprockets. Locks into operating position. If appropriate, cuts off excess film at exit port and removes. Attaches film cassette to camera and locks into place. Replaces camera cover.

iii) If there is an adequate film supply, checks that film is properly loaded.

iv) Performer advances film to compensate for any exposure of film due to installation or check.

v) Removes dark slide from camera lens.

vi) If not already done, performer writes or types a card with patient's identification information for use with spot film device. Inserts in slot in spot film camera as appropriate.

l. If examination will include use of cineradiography camera (attached to image intensifier), performer checks the amount of unexposed film remaining in the cine camera film magazine.

i) If appropriate, performer arranges to have film magazine loaded with film or decides to do personally (in darkroom).

ii) If performer has obtained newly loaded film magazine, attaches to camera by aligning and engaging film drive couplings. Slides in magazine until engaged; locks into position. Adjusts film and checks operation of film transport. Closes camera door and locks.

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iii) Advances film as appropriate onto the take-up spool.

iv) If not already done, may prepare card for identification of the cine film. Writes out or types appropriate patient identification information. Inserts identification card in cine camera in appropriate slot so that each frame will bear the ID information, or places other ID marker as appropriate.

m. If examination will include use of videotape, performer sets up magnetic tape cassette or video disc scanner for recording of image directly from the television monitor. Makes sure that there is sufficient tape. Prepares and checks replay mechanism. Sets controls at record position.

n. If a grid will be used with the image intensifier for fluoroscopy and/or spotfilming, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

3. Performer preselects technical exposure factors for fluoroscopy, cineradiography, and spotfilming, based on standards for pediatric patients set by the institution as appropriate for examination:

a. Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.

b. Performer reviews the technique chart(s) for the unit(s) to be used:

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- i) Locates information for the pediatric views involved. Takes note of the exposure factors to be used for overheads, fluoroscopy, and spot filming. Considers preferences of the radiologist involved, conversions needed to account for patient's age, condition, any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).
- ii) Performer looks up numerical conversion factors and calculates or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.
- iii) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

c. At the control panel, performer makes sure that indicator light shows that x-ray generator is "warmed up" and ready for use. Makes sure that all circuits have been stabilized. If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

d. As appropriate, performer sets x-ray generator mode selector(s) to fluoroscopic mode, and for use

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of spot film camera or cassette device, cineradiography, and overhead filming.

e. Performer sets controls on image intensifier for spot film camera or cassette device:

- i) For spot film camera, performer selects and sets the rate (frames per second) for the camera according to standards set for examination.
- ii) For cassette spot filming performer may select and set a standard spot film program providing for format combinations such as single, half, or quarter combinations on a single cassette and related spot film sizes. Selects program appropriate for examination or awaits orders from radiologist.
- iii) For cineradiography, performer selects and sets the frame rate appropriate to the examination involved. May select an appropriate frame per second range, and then make a finer adjustment within the range.

f. If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

g. If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

h. Performer selects and sets exposure factors for fluoroscopy:

- i) Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination.

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ii) If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved.

iii) Sets fluoroscopic examination timer to maximum position.

i. If appropriate, performer selects and sets exposure factors for spot filming:

i) For conventional manual exposure control, performer selects and sets the appropriate spot film time for the examination.

ii) For automatic, phototimed exposure control, performer selects a density exposure control appropriate for the examination.

iii) Performer selects the appropriate mA for the examination and the focal spot size to be used.

iv) Performer selects and sets kVp by combining settings on one major and one minor kVp selector as appropriate for the examination.

j. If appropriate, performer selects and sets exposure factors for cine filming:

i) If standard procedure calls for constant exposure timing per frame, performer selects and sets appropriate time in milliseconds.

ii) If standard procedure calls for constant average density, performer selects the appropriate density control setting as appropriate to examination.

iii) Performer selects and sets a combination of one major and one minor kVp setting to obtain appropriate kVp for examination.

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iv) Performer sets appropriate mA for the examination and focal spot size to be used.

k. If not already done, performer may set up x-ray and fluoroscope tube(s), image intensifier, collimator and accessories, as appropriate and prepares for check:

i) Makes sure that no one is in room.

ii) Places phantom or appropriate test object on radiography table where patient's area of interest will be centered for examination.

iii) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.

iv) If not already done, moves image intensifier and any spot-film device into position; centers (over or under) the area of interest.

v) Performer adjusts the x-ray tube to appropriate focal spot-object distance (target to skin distance, TOD). For fluoroscopy, adjusts distance between focal spot and image intensifier (focal spot to film distance, FFD). Makes sure that TOD is 15 inches or more. Operates controls or manually moves the x-ray tube(s) into place. Checks the focal-film distance by reading indicator scale in the tube housing; ad-

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justs up or down until the required FFD is obtained.

vi) Performer collimates fluoroscopy tube (and x-ray tube used for spot filming if different), depending on nature of the equipment and controls. Adjusts fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or sets shutter mode selector to automatic collimation. Manually sets collimator for the spot film field size to be used, or selects and sets field size control to be used for automatic collimation with programmed spot film cassette exposure sequence.

l. To check fluoroscopy mode, performer enters remote control room or operates controls in examination room behind leaded screen:

i) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.

ii) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.

iii) Checks mA meter and notes whether appropriate reading is obtained.

iv) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.

v) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

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m. To check spot film functioning, performer may move cassette or roll film into x-ray exposure field using appropriate controls.

i) Performer activates controls for spot film exposure. Notes whether cassette or roll film transport is operating appropriately. Notes whether exposure is terminated by phototimer or, if manual timer, in time set. If appropriate, releases spot film control after exposure.

ii) If equipment is operating appropriately, performer unloads cassette and reloads or advances roll film as appropriate. Moves bucky out of way until fluoroscopy is completed.

n. To check operation of cine equipment, performer may start anode rotation. Performer activates appropriate exposure switch for cine exposure and checks that film takeup is functioning appropriately. Shuts camera after testing and advances film as appropriate.

o. After equipment has been checked, performer shuts and resets for standard exposure factors. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

4. Depending on institutional procedures performer may bring requisition sheet, patient's chart and prior films to radiologist;may bring or escort patient, accompanying adult and/or staff mem-

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ber to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready.

a. If performer is to have patient readied in examination room, may proceed as follows:

i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.

ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.

iii) Performer greets patient and any accompanying staff person and/or parent or guardian, and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

iv) Makes patient comfortable on table.
If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.
Performer may decide to assist child to table or has this done. May obtain help. Makes sure that no equipment is in the way or may be collided with by patient.

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If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.
May have nurse carefully place infant in supine position on table, or lifts patient carefully, supporting infant's head, and places on table.

v) Makes sure patient is being attended and there is no danger patient will fall off table. Makes sure patient is never unattended.
If patient has a life support system in place, such as incubator, respiration, cardiac or infusion equipment, makes sure that equipment is being monitored.

vi) If not already done, has patient's clothing removed and has patient, especially neonate, put in gown and kept warm as appropriate.

vii) Answers patient's, parent's or guardian's questions honestly; attempts to reassure and develop confidence. Remains aware that patient and/or adult may be frightened and/or patient in pain. Performer explains to adult when asked medical questions that it is not appropriate for technologist to answer these; encourages adult to speak to physician.

viii) If not already done, performer checks that orders for prior preparation for study such as abstinence from food, drink, have been carried out. Plans to notify radiologist if any prior orders have not been carried out.

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ix) Depending on institutional arrangements and condition of patient, performer may indicate to parent or guardian that he or she must wait outside of examination room or that he or she may remain in room to help reassure patient.

x) Performer attempts to develop a warm interaction with patient so that infant or child remains calm during examination. May hold patient; may speak to patient in calm, gentle voice; may provide clean pacifier or toy. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of retardation. Is as calm and gentle as possible.

xi) With child, performer tells patient what will happen, and rehearses aspects of the procedure. Shows how x-ray unit and tilt-table moves and works. Performer explains truthfully if patient can be expected to feel any pain. Indicates how patient can help. Performer may describe how barium sulfate mixture will be administered orally, and what the contrast mixture will taste like. May describe what the doctor will be doing.

xii) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the chest and/or abdomen in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. If both recumbent and erect positioning will be used for radiography of abdominal contents, may measure or estimate thickness in both positions. Records for use in determining exposure factors for overheads. After measuring, has patient rest in as relaxed a position as possible.

b. Performer may inform attending radiologist that patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films to radiologist.

i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

ii) Performer may accompany radiologist to examination room and introduce patient and/or staff to radiologist.

iii) May provide gown, gloves, mask, lead apron and gloves.

c. If not already done, performer joins radiologist, patient and other staff in examination room.

i) Performer may note radiologist's decision on how to proceed; notes radiologist's orders for scout film, type of immobilization. Plans a "plain film" of the abdomen in standard AP position or as ordered.

ii) Performer provides patient, radiologist and anyone who will remain in room during exposure with appropriate protective

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shielding. If a staff member, parent, or guardian will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

5. If performer is to make a preliminary scout film of the abdomen, performer makes sure that patient is attended.

   a. Sets up equipment before positioning and immobilizing patient:

      i) Performer obtains the appropriate size loaded cassette for the first (or next) scout projection and attaches identification information to the cassette or table top.

      ii) Places right or left marker on cassette or table top as appropriate to the study and projection or depresses appropriate R or L button for automatic marking.
      If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette. If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette. Performer may place patient's card into card tray for equipment using automatic film marking device.

      iii) If a bucky is not being used, performer places cassette on table in approximate final position.
      With neonate, performer may wrap prepared cassette with plastic wrap before positioning cassette. Places wrapped cassette in position appropriate for filming (in preparation for placement of patient on cassette).

      iv) If cassette is to be used with bucky (under table top or in upright holder) performer may manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

      v) Performer selects the exposure factors for the preliminary scout projection taking account of the measurements taken of the patient.

      vi) Enters control room and sets controls for radiography mode.

      vii) For conventional exposure control, performer selects milliamperage and chooses selectors for the correct focal size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

      viii) For automatic phototimed exposure control, performer selects and sets the category corresponding to the type of study and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming).

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May select and set a kVp range button (if called for with the equipment) corresponding to the range for the examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

ix) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustment of table and tube height, position, and collimator (unless these have already been set).

x) Performer may return to overhead unit and set the focal-film distance (if not already done). Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

b. Performer has patient immobilized or does so personally:

i) May explain or demonstrate what is required for immobilizing and positioning. May obtain help or help co-worker.

ii) Performer may immobilize patient's arms by extending them and placing them along sides of head, next to the ears. May apply a sleeve made of a diaper, towel, pillowcase or orthopedic stockinet to hold arms so that sleeve holds arms above and behind head, one at each side. May apply a sleeve of stretch gauze or bandage to the pelvis. Wraps lightly to maintain patient in position.

iii) In positioning and immobilizing patient, performer remains alert to patient's respiration. Does not force patient into a position where any breathing difficulty increases. Does not force flexion of the neck.

iv) Performer centers part and keeps the long axis of the part parallel to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part.

v) In centering patient for view of abdomen, performer may include the diaphragm at the upper border of the area of interest. Palpates for the costal angle just below the xiphoid process or palpates for the heartbeat over the apex of the heart. Includes the mid-symphysis pubis at the lower border of the area of interest. Palpates for the symphisis pubis.

c. For a supine AP projection (posterior view) of the pediatric abdomen, performer centers patient in supine position on cassette or on table over bucky, or has this done:

i) Has patient's arms immobilized above and behind head next to ears as described; has lower legs immobilized as described, or tapes legs together just above knees.

ii) Performer adjusts patient so that median sagittal plane of body and head are centered to midline of cassette. May turn

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head to one side. Gently extends head and neck and immobilizes with head clamp, webbing strap under chin, or sponges so that median sagittal plane of head is at right angles or parallel to cassette. May elevate patient's knees and place restraining band across legs.

iii) Centers film to area of interest as described. Directs central ray at right angles to the midpoint of film.

iv) Performer may give child a clean pacifier,and tapes this into position unless this would impair respiration.

v) If not yet completed, performer immobilizes patient in position. Places restraining bands, strips of gauze, and adhesive tape as needed. May use head clamp; may use clean diaper stretched across the table and over the patient's head. Avoids use of compression band across abdomen or chest. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

vi) If, during positioning, patient shows signs of pain or distress, performer notifies radiologist at once and await orders.

d. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the patient to the x-ray field, or centers the part to the film holder, and uses the collimator light to center the tube to the part. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube position lengthwise or crosswise to provide better centering.

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e. Once the patient has been positioned and immobilized, performer adjusts the collimator so that a small unexposed border will appear around the edge of the film; collimates further so as to expose only the area of interest.

i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.

ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

f. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.
Makes sure that anyone holding the patient (if absolutely necessary) or remaining in room is supplied with lead gloves and apron and stays out of central beam as much as possible.

g. Performer may rehearse child in taking a deep breath, then breathing out and holding still, or observes infant patient's breathing, and plans exposure for the appro-

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priate instant for the phase required (expiration unless otherwise ordered). Plans to start exposure after chest has begun to decline, timed so that exposure is made before inhalation begins.

h. Performer makes the exposure:

   i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.
   ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells child when to take a deep breath, breathe out, and hold, or observes patient's breathing and times exposure to the appropriate instant for the phase required. Activates exposure for expiration after phase has begun.
   iii) Performer initiates exposure by pressing hand trigger or exposure control button.
   iv) While exposure is underway, performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.
   v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
   vi) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cutoff, or overexposure due to faulty timer).

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   vii) After exposure is completed, tells child and/or any adult with infant that he or she can relax.
   viii) After exposure performer returns to patient. Removes the cassette from the x-ray table or bucky. Removes any markers for further use.

i. Performer arranges to have the exposure processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

   i) While films are being processed, makes sure that patient is comfortable and attended by staff person, parent, or self.
   ii) Performer brings the processed scout film directly to the radiologist in charge, places on view box, and/or arranges to have viewed in darkroom; informs radiologist that the radiograph is ready.

6. During radiologist's review of requisition, scout, prior films and examination of patient, performer notes radiologist's orders:

   a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has orders for cleansing of patient and/or rescheduling filled out and signed as appropriate.
   b. Performer notes whether radiologist requires a change in technical factors and/or patient positioning or centering for later overhead filming.

      1) Performer records or notes orders for later use in the exam-

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ination and/or repeats preliminary radiography as ordered.

ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

c. If radiologist will proceed, notes radiologist's final orders on sequence of examination and use of contrast and equipment:

i) Notes route of administration of contrast, such as nasogastric catheter, nursing bottle, spoon, straw or cup.
ii) Notes type of contrast to be used, such as barium suspension, cream paste, iodized oil (for esophagus), whether, if barium, it is to be flavored. Notes amount needed.
iii) If nasogastric tube will be used, notes type and size.
iv) Notes whether air contrast of stomach may be done; if so, equipment needed.
v) Notes any final orders for rate and frame settings for cine, the program and settings for any spot filming, whether videotape will be used.
vi) Discusses sequence and timing of procedure with radiologist. May arrange signals for exposure, changing of spot film cassettes, operation of exposure controls.
vii) Performer arranges to provide or change any equipment or supplies as ordered by radiologist.
viii) If required, changes or adjusts technical factors, program settings as appropriate for fluoroscopy, spot filming and cine.

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If not already done, may put compression device into place on fluoroscopic unit. Once contrast medium has been selected, performer may restir mixture and prepare to administer; may decide to prepare and/or check syringe with contrast.

d. Performer may position or help position and immobilize patient for insertion of nasogastric tube or for oral administration of contrast:

i) Makes sure infant is being kept warm.
ii) May place patient in prone or supine position on table and immobilize.
iii) May have a child who can stand alone stand in front of table or sit on a stool.
iv) With infant, may immobilize patient on radiolucent board in AP position, check that patient is securely attached to board, and prop or position board in upright position. Has co-worker remain with patient to be sure patient or board does not fall.
v) May set up footboard at end of table, prop infant in seated position, and immobilize.
vi) When the patient and equipment are ready, performer indicates this to radiologist.

7. Performer assists radiologist as appropriate with preparations, administration of contrast, and fluoroscopy:

a. If a nasogastric tube will be inserted, performer may assist as follows:

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i) Washes hands as appropriate.

ii) If not already done, gives leaded gloves and apron to radiologist; places leaded curtain in place.

iii) May assist radiologist to prepare syringe with contrast mixture. May help position patient for fluoroscopic viewing.

iv) Performer may lubricate catheter tip on orders, following sterile procedure.

v) On signal from radiologist, performer may dim room lights. Turns on TV power switch. May go to control room and operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders.

vi) If some gastric contents are to be aspirated, performer may hold prepared test tube while radiologist ejects aspirated contents in syringe into it; or receives syringe with gastric contents. May arrange to have specimen prepared for laboratory or decides to do personally.

vii) Performer may tape the tube into place against patient's upper lip and cheek when radiologist indicates that the proximal end is in place in esophagus or stomach.

viii) May attach syringe with contrast to catheter if so ordered.

b. If the patient is to suck the barium through a feeding bottle, sip it through a straw, have it spoon fed, or will drink it from a cup, performer may assist as follows:

i) Performer may hold nursing bottle or cup with contrast mixture and spoon or straw and go to patient's side wearing lead shielding.

ii) At signal from radiologist, performer encourages patient to sip contrast mixture from cup, or straw, may feed it with spoon, or feeds infant with sterile bottle containing mixture; may have this done.

iii) Encourages child to hold mixture in mouth and swallow on signal from radiologist. May position patient's head or hold patient still.

iv) Repeats as ordered throughout fluoroscopic observation.

c. While radiologist observes filling on TV monitor, performer may assist:

i) Operates exposure controls as ordered, or positions table, tube, or patient as ordered.

ii) If spot film attachment uses cassettes, performer may unload as used, identify, and insert additional cassettes, as described above, throughout procedure.

iii) Performer may help radiologist to position patient in appropriate supine, prone, oblique and Trendelenburg positions. May operate tilt table on orders from radiologist.

iv) May operate replay mechanism of videotape attachment if so ordered.

v) For study of stomach, performer may position pressure cone on orders from radiologist or assist with paddle.

vi) Depending on institutional procedures, performer may keep radiologist informed of cumulative exposure as shown on fluoroscope timer indicator.

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vii) Performer notes any order for repeat of any part of fluoroscopic examination. Changes technical factors as ordered. Assists in continued examination as described above, repeating appropriate steps. Removes pressure cone or paddle when ordered.

d. When the radiologist informs performer that the fluoroscopic portion of the examination is over, performer notes orders for immediate overhead filming and any delayed serial filming:

- i) Notes whether additional contrast is to be administered by performer or radiologist.
- ii) Notes whether standard series of overheads are required and/or special positions, views, time sequences.
- iii) Notes particular areas of interest.
- iv) May note whether radiologist has marked patient's back at location of duodenal bulb or pylorus for centering purposes. If so, notes whether this was with patient in erect or prone position.
- v) May discuss with radiologist any special precautions needed in patient positioning.
- vi) May have radiologist fill out and/or sign requisition sheet.
- vii) Throughout procedure performer observes patient for any signs of emergency and/or to prevent or respond to an accident. Is alert to signs suggesting any impairment in patient's respiration. Notifies physician at once if patient shows emergency signs.

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8. Performer makes overhead films of the esophagus, stomach and duodenum as directed:

   a. Performer may assist while radiologist instills additional contrast through nasogastric tube; may administer additional contrast mixture orally as described above, or has this done. Observes patient until there is visible sign that patient has swallowed at least once. Explains to child what will happen next.

   b. Performer notes needed adjustment of technical factors from those used for scout film to allow for any changes requested by radiologist in technique or positions, and/or allows for use of contrast medium.

   c. Performer sets or resets the exposure factors for the first (or next) projection as described.

      - i) Adjusts technical exposure factors to account for instructions from radiologist based on viewing of scout film and use of contrast material.
      - ii) Performer identifies cassette as described earlier. May place marker on cassette to indicate time elapse or the number of the exposure within the series. Places cassette in position as described.
      - iii) May explain or demonstrate to child what is required. May obtain help in positioning or indicate how patient is to be positioned.
      - iv) Performer immobilizes patient's upper and lower limbs as described.

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v) With upright cassette holder adjusts height of holder to part and centers part to film.

d. If performer is to take overheads of the pediatric esophagus, performer notes the positions and views ordered. Maintains patient in recumbent position unless otherwise ordered.

i) For a PA projection (anterior view) of the pediatric esophagus, performer has patient placed in a prone position, with feet supported and head resting on chin or forehead and comfortably cushioned.
Performer may apply bands across table to keep upper thorax in contact with cassette or table top.
Adjusts cassette to include the area of interest as ordered. If entire esophagus is to be studied, centers to the level of the 5th or 6th thoracic vertebra. Directs central ray at right angles to the center of the film.

ii) For an upright AP projection of the pediatric esophagus, performer may immobilize patient's upper and lower extremities as described above. Sets infant up against footboard of horizontal x-ray table; places cassette behind patient's back. Secures and immobilizes patient in upright seated position using restraining bands across head, pelvis, and legs. May seat child on stool in front of upright cassette holder. Centers cassette to include area from sixth cervical vertebra to the eleventh thoracic vertebra. Directs central ray horizontally to midpoint of area of interest at right angles to film.

iii) For a lateral projection of the pediatric esophagus, performer notes side of interest and whether patient is to be positioned in a true lateral recumbent position or is to remain supine with x-ray tube directed horizontally across table to cassette placed vertically.

For lateral positioning, performer immobilizes patient's upper and lower extremities as described, and turns patient on to the side of interest, or has this done. Cushions neck, chin, and head, and keeps cheek level with the cassette. Uses tape, restraining bands, or diaper across table to support and hold patient in position. Directs central ray vertically at right angles to film, centered to the fifth or sixth thoracic vertebra.

For supine positioning for lateral projection, performer maintains patient in supine position as described. Positions grid cassette or grid holder vertically on table on side of interest. Supports so that x-ray beam may be directed horizontally at right angles to film. May place wedge shaped pads or radiolucent sponges beneath neck; checks that head is in true AP position. Centers cassette to the mid-axillary line of the body at the level of the fifth or sixth thoracic vertebra. Directs central ray at right angles to film, centered to midpoint of the area of interest.

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iv) For an oblique projection of the pediatric esophagus, performer positions patient from the supine position for a left AP oblique projection, or positions patient from the prone position for a right PA oblique projection unless otherwise ordered. Provides soft supports under patient. Performer elevates and supports the side opposite the side of interest on radiolucent sponge blocks or towels so that the shoulder and chest (or back) are in contact with the cassette or table at an angle of about 45°. Centers film to the chest at the level of the fifth or sixth thoracic vertebra.
Directs central ray at right angles to center of film at level of fifth or sixth thoracic vertebra.

e. If performer is to take overheads of the pediatric stomach and/or duodenum, performer notes the positions and views ordered and the area of interest. Does not use compression band across abdomen unless so ordered. Notes any centering mark made by physician to show the location of the pylorus (and whether made with patient erect or recumbent), or performer judges the location of the pylorus based on the patient's type of body (habitus), age, and the evidence of the scout film. If both erect and recumbent positions are ordered, centers somewhat lower for erect positioning than for recumbent positions, allowing greater change for thin, asthenic patient. Secures lead shielding so that it remains in place for erect positioning.

i) For an upright AP projection of the pediatric stomach and duodenum, performer has child stand in AP position in front of upright cassette holder. Immobilizes infant's upper and lower extremities and aligns patient on radiolucent board, and secures in true AP position; checks that patient is securely attached to board, and props or positions board in upright position; has co-worker remain with patient to be sure board or patient does not fall. Centers cassette in upright holder or vertical bucky to area of interest as defined, and directs central ray horizontally to midpoint of film through the median line of body. Maintains patient in position long enough before exposure for fluid levels to be accurately demonstrated.

ii) For lateral recumbent positioning in lieu of AP erect projection, positions as described in (iv), below. Centers cassette to area of interest in upright holder behind patient. Directs central ray horizontally at right angles to the midpoint of film through the median line of body. Maintains patient in position long enough before exposure for air or fluid levels to be accurately demonstrated.

iii) For oblique projections (right AP oblique and/or left PA. oblique) of stomach, positions patient as described for esophagus, but notes degree of rotation ordered and adjusts as appropriate. Centers cassette to midpoint of area of interest as marked or defined. Directs central ray at right angles to midpoint of film.

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iv) If lateral projections of pediatric stomach and/or duodenum are ordered, performer notes whether right and/or left lateral projections are involved. For a lateral recumbent projection, performer immobilizes patient's upper and lower extremities as described, and turns patient on to the side of interest or has this done. Cushions neck, chin, and head, and keeps cheek level with the cassette. Uses tape, restraining bands or diaper across table to support and hold patient in position.
For supine positioning for a lateral projection, performer maintains patient in supine position as described. May elevate on radiolucent sponge or pad. Positions vertical holder on appropriate side or positions grid cassette vertically on table. Supports so that x-ray beam may be directed horizontally at right angles to film. May place wedge shaped pads or radiolucent sponges beneath neck; checks that head is in true AP position.
Centers body so that a coronal plane passing midway between the midaxillary line and the anterior surface of the abdomen is at the midline. Centers at the marked or estimated level of the pylorus and allows for difference in erect or prone centering if marked position was made while patient was in opposite position from the one for this exposure. Directs central ray at right angles to the midpoint of the film.

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f. Performer repeats final check of positioning, collimates to area of interest, and provides shielding as described. Completes immobilization and makes sure that patient is not too restrained for normal functions. Rehearses child in suspended expiration as described. Makes sure that anyone holding the patient (if absolutely necessary) or remaining in room is supplied with lead gloves and apron and stays out of central beam as much as possible.
g. Performer makes exposure as described. Repeats and continues for all the overhead views ordered, adjusting technical factors, patient positions, and tube angulation as appropriate for each projection.

9. Performer arranges to have spot films, overheads, and any cine film processed at once:

a. May sign or have radiologist sign requisition sheet.
b. Checks that equipment is turned off.
c. With cassette spot films and overhead exposures, removes any markers for further use. Attaches ID card for use with flasher if appropriate.
d. With spot film camera, performer advances the film so that all exposures made will be wound on the take-up spool in the roll film cassette. Replaces dark slide on camera lens. Uses device to cut film and create a light shield. Resets counter and removes film cassette.
e. With cineradiography, performer checks that cine camera is turned

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off and that the film transport mechanism has come to a complete stop. Unlocks and removes film magazine.

f. Performer arranges to have overheads, spot films and cine film processed at once if appropriate or decides to process personally.

g. While films are being processed, makes sure that patient is comfortable and attended by nurse, radiologist, staff member, or self.

h. When the overheads and spot films have been processed and returned, performer places on view boxes. May also hang scout and prior films. May give processed cine film to radiologist and set up cine projector and screen. Informs radiologist that radiograph(s) are ready for viewing.

i. Performer makes note of radiologist's decisions regarding adequacy of the radiographs and further orders:

   i) If radiologist decides to administer further contrast medium, performer assists as above and with any fluoroscopy and spot filming. Repeats any additional overhead radiography as ordered.

   ii) If the radiologist indicates that there is any problem with the technical factors or the patient positioning for overheads, performer records or notes for use in any "retakes" ordered. Notes source of problem so that performer can avoid future "retakes."

   iii) Repeats radiography for any additional overhead exposures ordered by radiologist, adjusting technical factors, tube, and position of patient or film holder as appropriate to each view ordered. Repeats identification, collimation, shielding, orders for breath control and exposure as above.

   iv) If radiologist decides to carry out air contrast study of the stomach, performer notes orders on method of administration such as nasogastric tube and empty syringe, straw with hole in shaft, empty feeding bottle, or carbonated beverage in cup or feeding bottle. Prepares materials if not already done.

   v) If radiologist decides to follow with a delayed small bowel study, notes orders on timing and position(s) required; notes whether additional contrast will be administered.

   vi) If appropriate, has radiologist fill out or sign requisition.

   vii) If appropriate, has radiologist authorize order for feeding patient when this will not interfere with the remainder of the study. Has order placed and patient fed as appropriate or decides to do personally.

10. If an air contrast study is to be carried out, performer assists with positioning of patient, insertion of nasogastric tube if so ordered, and fluoroscopy, as described earlier.

   a. If performer is to assist with administration of air contrast, may prepare empty syringe; may prepare carbonated beverage in cup or sterile bottle and await orders. May place straw in child's mouth so that hole in shaft is outside mouth. Shows child how to suck in air. On orders from radiologist assists with patient's drinking beverage or taking in air.

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b. Assists with continued fluoroscopic examination, spotfilming and pressure spotfilming as described abov after injection of air contrast.

c. Notes orders on overhead films and repeats as appropriate for views of stomach.

d. Performer shows subsequent sets of spotfilms and radiographs to radiologist as processed, and proceeds as described above until radiologist indicates that this stage of examination is completed.

11. If delayed small bowel films are ordered, performer proceeds as follows:

a. May arrange to inform nursing staff in charge of patient's care.

b. Performer may arrange to have child or infant taken to appropriate holding area. Keeps track of the time elapse. Makes sure that patient is in the care of a staff person who will transport to appropriate location and return patient at appropriate time.

c. Assists with additional contrast as described.

d. May check that patient is fed after contrast has reached the mid-small bowel. May encourage patient to empty bladder before each delayed film or has this done.

e. If fluoroscopy and spotfilming is to be done, assists as described above.

f. At appropriate time(s) and as often as appropriate to complete delayed series, performer carries out steps for delayed filming as ordered, following similar positioning and exposure steps as described above.

i) Keeps track of time elapse and readies patient for each exposure as appropriate.

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ii) Performer takes film(s) of the small bowel as ordered. Positions as ordered (as described), and centers film to include the pubic symphysis.

iii) In all delayed series performer makes sure to include a time-interval marker on each film.

iv) Performer makes radiographs and arranges for processing as described above. Depending on institutional arrangements, performer places processed delayed radiographs for later viewing by radiologist or places on view boxes as processed and informs radiologist that they are ready; notes radiologist's further orders.

12. When the radiologist indicates that the radiography is completed, or at intervals during procedure, performer may carry out termination or follow-up procedures:

a. When appropriate, may assist radiologist in removal of nasogastric tube.

b. Performer may have patient cleansed, fed. Removes any markings from patient's body.

c. May decide to assist child from table. Makes sure patient is reminded of any footrest in stepping off table. Makes sure that none of the equipment is projecting over the patient before allowing patient to rise from table, and assists patient.

d. Performer may have patient transported back to room, to parent or guardian, or to next location, depending on institutional arrangements. Makes sure that patient is in the care of a staff person who

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will transport to appropriate next location. e. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed to avoid infection or contamination, or decides to do personally, depending on institutional arrangements. f. May check that gastric contents sample has been prepared for laboratory, is properly identified, or decides to do personally. May present lab. order form to radiologist for signature. g. May present requisition form to radiologist for comments and signature. h. Performer records the examination according to institutional procedures. May include date, room, examination type, the overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each spotfilm and overhead view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet. i. Performer may record the fluoroscopy examination including exposure time and rad dosage (using posted information). j. Performer may decide to jacket radiographs, requisition sheets, and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. k. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

TASK DESCRIPTION SHEET

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1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected,set for fluoroscopy,spotfilming,cine,overheads;scouts taken;assistance given with insertion,flow of enema,positioning,fluoroscopy,spotfilming,defecation,air contrast; pre-and post-evacuation,air contrast exposures made; radiographs sent for processing,for radiologist review;procedures repeated as ordered;clean-up done;pt returned;examination recorded;radiographs placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen; x-ray generator,control panels,tube,bucky,table,collimator;fluoroscopy unit,image intensifier,spotfilm device,TV monitor;cassettes;roll film;cine camera, film;videotape device;extension cones;vertical cassette holder;contrast enema;stand;rectal tips;tubes; barium paste,air insufflator,pressure regulator,syringe,balloon catheters;R-L,ID markers;colostomy or ileostomy dressings;bedpan;toweling;water-proof table covering;basin;defecation stool,chair or bag; emergency cart;phone;marking pen;calipers;tape; shielding;immobilization devices;head clamp,band, gauze,pillowcase,stockinet,diapers;padding;pacifier, toys;technique,standard view,tube rating,rad exposure charts;phantom;test object;stretcher,incubator;forms

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(x) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Pediatric pt.;radiologist;nurse;accompanying adult; surgeon;pediatrician;co-worker

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking barium enema,intussusception or defecography radiographs of pediatric pt. by reviewing request; preparing equipment;reassuring,measuring pt.;setting up for fluoroscopy,spotfilming,video,cine;taking scout films;setting technical factors;identifying films;providing shielding;collimating;inserting or assisting with enema,fluoroscopy,spotfilming,defecation,air contrast;taking pre-post-evacuation,air contrast radiographs as ordered;arranging for processing,review and clean-up;having pt. returned;placing radiographs for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient identification card, and any appropriate medical-technical history for a pediatric patient scheduled for a radiographic contrast study of the large intestine,such as a barium enema study, radiographic diagnosis of intussusception (invagination of one portion of the intestinal tract into the lumen of an immediately adjoining part) with possible reduction (correction) using barium enema for hydrostatic pressure, or defecography (study of anorectal region during defecation) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior plain film(s) and/or prior contrast films.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, and to check the completeness of the information provided:

    a. Performer checks the examination called for, the purpose of study and any special requests. Notes

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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whether an air contrast study may be ordered.

b. Performer reads patient's name, identification number, sex, age, weight and height. Notes whether patient is in-patient, out-patient, or emergency patient; notes whether patient is a neonate.

c. Notes the name of the radiologist in charge; may note whether an attending pediatrician and/or surgeon will be present and the name(s).

d. Notes any special information that could affect patient positioning, technique, immobilization, or handling, such as presence of IV drip, oxygen supply, colostomy, ileostomy, anal abnormality, hemorrhoids, acute symptoms. Notes whether patient will arrive in incubator, on stretcher, or in a wheelchair. Notes whether patient will be accompanied by nurse, other staff person, parent or guardian. Checks whether isolation technique is required for patient with communicable or infectious condition or neonate.

e. Performer notes any orders for type of equipment, type of contrast medium (barium enema ingredients, use of saline, use of water soluble contrast, air).

f. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, and the examination ordered.

   i) Notes whether procedure will make use of fluoroscopy, spot filming, cineradiography, videotape, overheads.

   ii) Notes whether a grid or bucky will be used; notes appropriate shielding.

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g. If patient's record indicates orders for prior preparation, such as cleansing enema, abstinence from food and/or drink (or no prior preparation), prior sedation, IV infusion, check of electrolyte level, performer may note proper timing and may check that orders were carried out and at appropriate time.

   i) If not carried out or at proper time, may arrange to delay examination or informs appropriate staff member.

   ii) May note patient's feeding schedule and arrange to have patient fed while in department at appropriate point in the examination.

h. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

   i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention. Notes any record of technical factors used for prior films.

   ii) If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to select technique or prepare for exami-

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nation, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

i. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary:

   a. Washes hands as appropriate; depending on patient's condition, may arrange for or carry out isolation or decontamination techniques; checks that masks, gowns, gloves are available.
   b. May check that temperature in room is warm enough.

      i) With neonate may arrange to have patient kept warm.
      ii) For defecography performer may prepare disposable adhesive bag or chair, or pot fitted with disposable bag, depending on patient's age and condition.

   c. Checks that procedure tray has been prepared for the study involved or decides to do personally:

      i) Depending on institutional procedures and equipment, performer may check that barium enema has been prepared with proper ingredients and proportions or decides to do personally. Hangs on standard or pole next to examination table. If not already done, may check that enema suspension is at proper temperature. If not already done, attaches tubing and maintains clamp in closed position.
      ii) If a closed-system disposable enema kit is to be used, performer has mixture prepared, air and excess water removed from bag, tube clamped, and mixture shaken and kneaded before hanging bag in place.
      iii) If a water soluble opaque medium is to be used for enema, performer checks that there is no chemical deterioration.
      iv) Performer may check that a barium paste is available for marking patient or has this done.
      v) Depending on information available, performer may check that appropriate rectal tips or balloon retention catheters are provided. If balloon catheter may be used, has it checked or decides to check personally.
      vi) Checks for air injection apparatus, bedpan, water soluble lubricant, towels. May check that local anesthetic is available.
      vii) If patient has colostomy or ileostomy, may check that device to prevent stomal leakage is present. Provides fresh dressing and drainage bag for use after procedure.

   d. Performer makes sure that examination table is provided with disposable and/or waterproof underpadding; may cover table with ab-

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sorbant paper sheet or decides to do personally.

e. Checks that emergency cart is present or available.

f. Checks that proper accessories for pediatric patient are available including leaded rubber shielding, aprons, and gloves to be used by performer, radiologist, the patient, and anyone who will remain in the room during exposure, and appropriate immobilization devices for infant or child, mattress, pads, pillows and/or blankets.

  i) If an infant is to be positioned for erect projections, performer may check that there is radiolucent board available.

  ii) Checks that clean pacifiers and toys are present.

g. Performer checks that x-ray equipment is provided with grid and/or high speed bucky and that overhead, fluoroscopy, cineradiography, video capabilities are available as appropriate. Checks for vertical cassette holder.

h. Makes sure that right (R) and left (L) markers are available for use and identification cards, or leaded numerals or markers.

i. For overhead filming performer makes sure that an adequate supply of loaded cassettes are available in the examination room. Selects appropriate speed and type of film, grid, and cassette combination depending on whether a bucky or table top technique will be used and standard institutional practices. Selects size based on patient's size and area of interest. If adequate supply is not in room, arranges to obtain or decides to obtain personally.

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j. Performer prepares for identification of overhead films using equipment provided by institution:

  i) May obtain lead numerals and tape and prepare identification strip for placement on cassettes giving appropriate patient identification information.

  ii) Performer may prepare for use of flashcard by checking that there is piece of lead on cassette surfaces; may write or type out ID information on card if not received with requisition.

  iii) Checks identification against requisition sheet.

k. If examination will include spot filming using a cassette/bucky spot film device, performer checks that there is an adequate supply of appropriate size cassettes in room.

  i) If there is insufficient supply of cassettes, arranges to obtain or decides to obtain personally.

  ii) Performer carries out identification of the spot film cassettes as for overhead films.

  iii) Performer may use controls or manually pull out spot film bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position.

  iv) If R-L markers are to be used with spotfilming, performer

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tapes into place on image intensifier screen or plans to tape to patient's body.

l. If examination will include spot filming using a camera (attached to image intensifier) and roll film, performer checks film supply indicator to make sure that there is sufficient film in the roll film cassette.

   i) If there is insufficient roll film in camera, performer arranges to have roll film cassette loaded, or decides to do personally.
   ii) When loaded roll film cassette is obtained, performer checks loading in subdued light. Checks that end of film is cut correctly and is properly threaded and attached to take-up spool so that film unwinds appropriately. Checks that film is properly engaged in sprockets. Locks into operating position. If appropriate, cuts off excess film at exit port and removes. Attaches film cassette to camera and locks into place. Replaces camera cover.
   iii) If there is an adequate film supply, checks that film is properly loaded.
   iv) Performer advances film to compensate for any exposure of film due to installation or check.
   v) Removes dark slide from camera lens.
   vi) If not already done, performer writes or types a card with patient's identification information for use with spot film device. Inserts in slot in spot film camera as appropriate.

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m. If examination will include use of cineradiography camera (attached to image intensifier), performer checks the amount of unexposed film remaining in the cine camera film magazine.

   i) If appropriate, performer arranges to have film magazine loaded with film or decides to do personally (in darkroom).
   ii) If performer has obtained newly loaded film magazine, attaches to camera by aligning and engaging film drive couplings. Slides in magazine until engaged; locks into position. Adjusts film and checks operation of film transport. Closes camera door and locks.
   iii) Advances film as appropriate onto the take-up spool.
   iv) If not already done, may prepare card for identification of the cine film. May write out or type appropriate patient identification information. Inserts identification card in cine camera in appropriate slot so that each frame will bear the ID information, or places other ID marker as appropriate.

n. If examination will include use of videotape, performer sets up magnetic tape cassette or video disc scanner for recording of image directly from the television monitor. Makes sure that there is sufficient tape. Prepares and checks replay mechanism. Sets controls at record position.

o. If a grid will be used with the image intensifier for fluoroscopy and/or spotfilming, performer positions and centers grid if not already done. May use control but-

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ton or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

3. Performer may preselect technical exposure factors for overheads, fluoroscopy, cineradiography and spot filming, based on standards for pediatric patients set by the institution as appropriate for examination:

   a. Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.
   b. Performer reviews the technique chart(s) for the unit(s) to be used:

      i) Locates information for the pediatric projections involved. Takes note of the exposure factors to be used for overheads (pre- and post-evacuation, air contrast), fluoroscopy, and spot filming.
      ii) Considers preferences of the radiologist involved, patient's age, condition, and any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision) and decides whether conversion of factors is needed.
      iii) Performer looks up numerical conversion factors and calculates or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.
      iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating

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chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

   c. At the control panel, performer makes sure that indicator light shows that x-ray generator is "warmed up" and ready for use. Makes sure that all circuits have been stabilized. If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.
   d. As appropriate, performer sets x-ray generator mode selector(s) to fluoroscopic mode, and for use of spot film camera or cassette device, cineradiography, and overhead filming.
   e. Performer sets controls on image intensifier for spot film camera or cassette device:

      i) For spot film camera, performer selects and sets the rate (frames per second) for the camera according to standards set for examination.
      ii) For cassette spot filming, performer may select and set a standard spot film program providing for format combinations such as single, half, or quarter combinations on a single cassette and related spot film sizes. Selects program appropriate for examination or awaits orders from radiologist.
      iii) For cineradiography, performer selects and sets the frame

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rate appropriate to the examination involved. May select an appropriate frame per second range and then make a finer adjustment within the range.

f. If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

g. If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

h. Performer selects and sets exposure factors for fluoroscopy:

  i) Selects and sets the kVp at the standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination.
  ii) If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved.
  iii) Sets fluoroscopic examination timer to maximum position.

i. If appropriate, performer selects and sets exposure factors for spot filming:

  i) For conventional manual exposure control, performer selects and sets the appropriate spot film time for the examination.
  ii) For automatic, phototimed exposure control, performer selects a density exposure control appropriate for the examination.
  iii) Performer selects the appropriate mA for the examination and the focal spot size to be used.

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  iv) Performer selects and sets kVp by combining settings on one major and one minor kVp selector as appropriate for the examination.

j. If appropriate, performer selects and sets exposure factors for cine filming:

  i) If standard procedure calls for constant exposure timing per frame, performer selects and sets appropriate time in milliseconds.
  ii) If standard procedure calls for constant average density, performer selects the appropriate density control setting as appropriate to examination.
  iii) Performer selects and sets a combination of one major and one minor kVp setting to obtain appropriate kVp for examination.
  iv) Performer sets appropriate mA for the examination and focal spot size to be used.

k. Performer may preset the exposure factors for the first overhead projection anticipated. Makes sure that technique relates to the combination of film type and speed, focal spot size, FFD and use or nonuse of other accessories (such as screens, grid, bucky, etc.) and the probable thickness of the part and collimated field size to be used.

  i) Sets controls for radiography mode.
  ii) For conventional exposure control, performer selects milliamperage and chooses selectors for the correct focal spot size. Selects and sets the exposure

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time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

iii) For automatic phototimed exposure control, performer selects and sets the category corresponding to the type of study, and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming).
May select and set a kVp range button (if called for with the equipment) corresponding to the range for the examination.
Sets a density selector corresponding to the usual (or special) requirements for the study.
Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

iv) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustment of table and tube height, position, and collimator (unless these have already been set).

1. If not already done, performer may set up x-ray and fluoroscope tube (s), image intensifier, collimator and accessories as appropriate:

   i) Makes sure that no one is in room.

   ii) Places phantom or appropriate test object on radiography table

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where patient will be centered for examination.

   iii) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.

   iv) If not already done, moves image intensifier and any spotfilm device into position; centers (over or under) the area of interest.

   v) Performer adjusts the x-ray tube to appropriate focal spot/object distance (TOD). For fluoroscopy adjusts distance between focal spot and image intensifier (focal spot to film distance, FFD). May check that TOD is 15 inches or more. Operates controls or manually moves the x-ray tube(s) into place. Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD is obtained.

   vi) Performer may collimate fluoroscopy tube (and x-ray tube used for spotfilming if different), depending on nature of the equipment and controls. Adjusts fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or sets shutter mode selector to automatic collimation.
   Manually sets collimator for the spotfilm field size to be used, or selects and sets field size control to be used for automatic collimation with programmed spotfilm cassette exposure sequence.

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m. To check fluoroscopy mode, performer enters remote control room or operates controls in examination room behind leaded screen:

  i) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.
  ii) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.
  iii) Checks mA meter and notes whether appropriate reading is obtained.
  iv) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.
  v) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

n. To check spot film functioning performer may move cassette or roll film into x-ray exposure field using appropriate controls:

  i) Performer activates controls for spot film exposure. Notes whether cassette or roll film transport is operating appropriately. Notes whether exposure is terminated by phototimer or, if manual timer, in time set. If appropriate, releases spot film control after exposure.
  ii) If equipment is operating appropriately, performer unloads cassette and reloads or advances roll film as appropriate. Moves bucky out of the way until fluoroscopy is completed.

o. To check operation of cine equipment, performer may start anode rotation. Performer activates appropriate exposure switch for cine exposure and checks that film takeup is functioning appropriately. Shuts camera after testing and advances film as appropriate.

p. After equipment has been checked, performer shuts and resets the standard exposure factors. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. May arrange for alternate unit to be used.

4. Depending on institutional procedures performer may bring requisition sheet, patient's chart and prior films to radiologist; may bring patient and accompanying adult and/or staff member to examination room; and/or may join radiologist, other physicians, and patient after informing radiologist that equipment is ready.

  a. If performer is to have patient readied in examination room, may proceed as follows:

    i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.
    ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done). Depending on institutional ar-

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rangements, performer may decide to assist in bringing patient to examination room.

iii) Performer greets patient and any accompanying staff person and/or parent or guardian, and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

iv) Makes patient comfortable on table. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.
Performer may decide to assist child to table or has this done. May obtain help. Makes sure that no equipment is in the way or may be collided with by patient. If assisting child to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.
May have nurse carefully place infant in supine position on table, or lifts patient carefully, supporting infant's head, and places on table.

v) Makes sure patient is being attended and there is no danger patient will fall off table. Makes sure patient is never unattended.
If patient has a life support system in place, such as incubator, respiration, cardiac or infusion equipment, makes sure that equipment is being monitored.

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vi) If not already done, has patient's clothing removed and has patient, especially neonate, put in gown and kept warm as appropriate.

vii) Answers patient's, parent's, or guardian's questions honestly; attempts to reassure and develop confidence. Remains aware that patient and/or adult may be frightened and/or patient in pain. Performer explains to adult when asked medical questions that it is not appropriate for technologist to answer these; encourages adult to speak to physician.

viii) If not already done, performer may check that prior preparations were carried out. If not, may arrange to have these done or plans to notify radiologist.

ix) Depending on institutional arrangements and condition of patient, performer may indicate to parent or guardian that he or she must wait outside of examination room or that he or she may remain in room to help reassure patient.

x) Performer attempts to develop a warm interaction with patient so that infant or child remains calm during examination. May hold patient; may speak to patient in calm, gentle voice; may provide clean pacifier or toy. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning. Is as calm and gentle as possible.

xi) With child, performer may tell patient what will happen, and may rehearse aspects of the procedure. May explain the process of instilling the barium

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enema. May indicate that some cramping may occur. May review the positions patient will be in, tube insertion, and what instructions radiologist may give to direct the flow of the barium. May instruct child in keeping the anal sphincter contracted against rectal tube to hold it in position and retain enema. May rehearse patient in deep oral breathing to ease cramping. Assures patient that enema will be stopped if cramping is severe. May indicate how enema will be evacuated (returned by way of tube with disposable kit, use of basin, going to bathroom, or use of special chair for defecography). May demonstrate how tilt-table will be used and reassure patient that he or she will be held safely.

xii) If patient is suffering from inflamed anus, hemorrhoids, or anal abnormality, performer may place patient in prone, knee-chest position while performer applies local anesthetic such as suppository and/or salve or may have this done. Performer uses gloves or supplies gloves and discards after use. Washes hands.

xiii) May question staff member to determine whether patient is able to retain an enema; plans to report information to radiologist if appropriate.

xiv) If colostomy or ileostomy dressing is to be removed, performer may arrange to have this done. If zinc or iodoform paste or radiopaque gauze is being used, performer checks that radiopaque paste or gauze is completely removed. Checks that patient has a dressing available; may supply a temporary dressing for use until enema tip is inserted.

xv) If patient is to be radiographed in erect position, performer adjusts vertical film holder to appropriate height for patient. Performer may tape R or L marker to patient if appropriate for use in spot filming.

xvi) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the abdomen in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. If both recumbent and erect positioning will be used, may measure or estimate thickness in both positions. Records for use in determining final exposure factors for overheads. After measuring, has patient rest in as relaxed a position as possible.

b. Performer may inform attending radiologist that patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films to radiologist. Displays radiographs on view boxes.

i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

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ii) Performer may accompany radiologist to examination room; may greet or introduce patient and members of staff. May provide lead apron, gloves, hospital gown, mask and gloves.

c. If not already done, performer joins radiologist and staff in examination room.

i) During radiologist's review of requisition, prior films, and examination of patient, performer notes radiologist's orders.

ii) May note radiologist's decision on how to proceed, orders for scout film(s), type of equipment to be used.

iii) If radiologist decides to cancel procedure, performer may arrange to terminate and reschedule as appropriate, have forms filled out.

iv) If radiologist will proceed, performer provides patient, radiologist, other physicians and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member, parent, or guardian will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

5. If performer is to make preliminary (scout) film(s) of the abdominal area, makes sure that patient is attended and proceeds as follows:

a. Sets up equipment before positioning and immobilizing patient:

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i) Performer obtains the appropriate size loaded cassette for the first (or next) scout projection and attaches identification information to the cassette or table top:

ii) Places right or left marker on cassette or table top as appropriate or depresses appropriate R or L button for automatic marking.

If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.

If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.

Performer may place patient's card into card tray for equipment using automatic film marking device.

iii) If a bucky is not being used, performer places cassette on table approximating final positioning.

iv) If cassette is to be used with bucky (under table top or in upright holder) performer may manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and moves out of way until needed.

v) Performer may reset the exposure factors taking account of the measurements taken of the patient.

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vi) Sets the focal-film distance if not already done. Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD (TFD) is obtained.

b. Performer has patient immobilized or does so personally:

i) May explain or demonstrate what is required for immobilizing and positioning. May obtain help or help co-worker.
ii) Performer may immobilize patient's arms by extending them and placing them along sides of head, next to the ears. May apply a sleeve made of a diaper, towel, pillowcase or orthopedic stockinet to hold arms so that sleeve holds arms above and behind head, one at each side. May apply a sleeve of stretch gauze or bandage to the pelvis. Wraps lightly to maintain patient in position.
iii) In positioning and immobilizing patient, performer remains alert to patient's respiration. Does not force patient into a position where any breathing difficulty increases.

c. Performer centers part and keeps the long axis of the part parallel to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part. With upright holder adjusts height of holder to part and centers part to film.

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i) Performer may judge the point for centering based on the patient's type of body (habitus). If both erect and recumbent positions are ordered, centers somewhat lower for erect positioning than for recumbent positions, allowing greater change for thin, asthenic patient.
ii) In centering to the level of the iliac crests, performer makes sure to palpate for the crest of the bone rather than use visual points of muscle or fatty tissue.
iii) For erect positioning maintains patient in position long enough before exposure for air or fluid levels to be accurately demonstrated.

d. For a supine AP projection (posterior view) of the pediatric abdomen, performer centers patient in supine position on cassette, on table over bucky, or has this done.

i) Has patient's arms immobilized above and behind head next to ears as described; has lower legs immobilized as described, or tapes legs together just above knees.
ii) Performer adjusts patient so that median sagittal plane of body and head are centered to midline of cassette. May immobilize head with head clamp, webbing strap under chin, or sponges so that median sagittal plane of head is at right angles or parallel to cassette. May elevate patient's knees and place restraining band across legs.

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- iii) Centers film to the iliac crest as described. Directs central ray at right angles to the midpoint of film.
- iv) Performer may give infant a clean pacifier and tape this into position unless this would impair respiration.

e. For an erect AP projection (posterior view) of a child's abdomen, performer positions patient standing or seated in front of upright cassette holder with weight distributed equally. Centers film as described above and directs central ray horizontally at right angles to midpoint of film.

f. For erect AP projection (posterior view) of the infant abdomen, performer immobilizes patient's upper and lower extremities as described above.

- i) Aligns patient on radiolucent board and secures in true AP position.
- ii) Checks that patient is securely attached to board.
- iii) Props or positions board in upright position and has co-worker remain with patient to be sure board or patient does not fall.
- iv) Centers cassette in upright holder or vertical bucky to the iliac crest, and directs central ray horizontally to midpoint of film at the mid-line of body.

g. Performer may rehearse child in breath control such as breathing in deeply, breathing out, and holding breath (suspended exhalation) when ordered, or observes infant patient's breathing, and plans exposure for the appropriate instant

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for the phase required (expiration unless otherwise ordered). Plans to start exposure after chest has begun to decline, timed so that exposure is made before inhalation begins.

h. If not yet completed, performer immobilizes patient in position. Places restraining bands, strips of gauze, and adhesive tape as needed. May use head clamp; may use clean diaper stretched across the table and over the patient's head. Avoids use of compression band across abdomen or chest. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

- i) If, during positioning, patient shows signs of pain, performer notifies radiologist at once and awaits orders.
- ii) Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the patient to the x-ray field, or centers the part to the film holder, and uses the collimator light to center the tube to the part. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube position lengthwise or crosswise to provide better centering.

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i. Once the patient has been positioned and immobilized, performer adjusts the collimator so that a small unexposed border will appear around the edge of the film; collimates further so as to expose only the area of interest.

i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.

ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

j. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.
Makes sure that anyone holding the patient (if absolutely necessary) or remaining in room is supplied with lead gloves and apron and stays out of central beam.

k. Performer makes the exposure:

i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

ii) Returns to control panel. Makes sure controls are properly set and patient is still in position.

iii) As rehearsed, tells child when to take a deep breath, breathe out, and hold, or observes patient's breathing and times exposure to the appropriate instant for the phase required. Activates exposure for expiration after phase has begun.

iv) Performer initiates exposure by pressing hand trigger or exposure control button.

v) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

vi) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.

vii) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cut-off, or overexposure due to faulty timer).

viii) After exposure is completed, tells child and/or any adult with infant that he or she can relax.

ix) After exposure performer returns to patient. Removes the cassette from the x-ray table or bucky. Removes any markers for further use.

l. If more than one scout film has been ordered, performer repeats as appropriate for additional exposures.

m. Performer arranges to have the exposure(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

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i) While films are being processed, makes sure that patient is comfortable and attended by staff person, parent or self.

ii) Performer brings the processed scout film(s) directly to the radiologist in charge, places on view box(es), and/or arranges to have viewed in darkroom; informs radiologist that the radiograph is (are) ready.

6. During radiologist's review of scout films and other information performer notes radiologist's orders:

a. If radiologist decides to cancel procedure, performer arranges to terminate and/or reschedule as appropriate.

b. Performer notes whether radiologist requires a change in technical factors and/or patient positioning or centering for later overhead filming.

i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.

ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and reacts as appropriate to avoid any need for future "retakes."

c. If radiologist will proceed, notes final orders on sequence of examination and use of materials and equipment:

i) Notes contrast material for enema such as barium sulfate mixture, iodine-based, water soluble agent or other liquid medium, and amount needed. Adjusts or changes as appropriate.

ii) Notes height at which enema is to be hung. Readjusts height if appropriate. Checks that there is a free flow of contrast through apparatus and reclamps.

iii) Notes orders on use of simple rectal enema tip, use of balloon or other soft catheter or other retention device, whether air contrast may be needed. Arranges to provide or change any equipment. If balloon catheter is to be used, makes sure that it has been checked for defects.

iv) For defecography notes orders on type of equipment to use to position patient, and prepares if not already done. Notes whether anal canal will be opacified with barium paste instead of use of enema.

v) Notes radiologist's orders for program and settings for spot filming and/or technical factors for fluoroscopy, rate and frame settings for cine; notes whether videotape will be used. If required, changes, adjusts, or sets up technical factors, program, and settings for fluoroscopy, videotape, cine and/or spot filming as described. Sets or changes as appropriate.

vi) Discusses sequence and timing of procedure with radiologist. May arrange signals for flow of enema, exposure, changing of spot film cassettes, operation of exposure controls.

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d. Performer prepares for insertion of enema tip as ordered:

- i) Washes hands as appropriate and dons gloves.
- ii) Unclamps enema tube and allows the mixture to run out into basin to expell air; reclamps.
- iii) Lubricates rectal tip, balloon catheter tip, or stomal catheter tip with water soluble lubricant.
- iv) If anal canal is to be opacified without enema, lubricates tip with thick barium paste.
- v) Performer positions and immobilizes patient for insertion or assists.
- vi) If appropriate, places leaded curtain in place.
- vii) If performer will position patient for enema, performer assists or places patient prone on table; turns patient on left side, leaning forward, and draws up right knee and thigh, with left knee slightly flexed. Immobilizes and reassures child. May adjust lamp.
  Places patient with colostomy or ileostomy on back.
- viii) Adjusts patient's gown to expose only anus (or stoma).
- ix) For study such as for imperforate anus, performer uses thick barium paste and marks patient in the middle of the natal cleft, perinum and the anal dimple.

e. Performer inserts rectal tip or balloon catheter tip or assists:

- i) With patient who has colostomy or ileostomy, waits while radiologist inserts stomal catheter.

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- ii) May place rectal tube or balloon tip in fold of several sheets of paper toweling.
- iii) May expose anus and inspect condition, such as for presence of hemorrhoids, so as to anticipate correct insertion technique.
- iv) Reassures child and has him or her relax anal sphincter.
- v) Pushes right buttock upward to open gluteal fold.
- vi) On exhalation of patient, performer slowly inserts catheter or rectal tip forward into anal opening, then, following curve of rectum, slightly backward. Inserts as far as appropriate as ordered, depending on patient's condition. If anal canal is to be opacified without enema, passes tip lubricated with barium paste in and out several times.
- vii) If patient reacts with pain or if performer cannot insert tip easily, performer informs radiologist at once.
- viii) If balloon catheter is to be used, performer inserts tip in rectum and informs radiologist. Waits while radiologist inflates the catheter balloon by attaching syringe to balloon lumen and injecting water or air to inflate balloon inside rectum (with or without fluoroscopic control).May indfcate to radiologist when catheter is being held in place. May clamp off lumen and disconnect syringe. Inserts a self-sealing device or uses clamp.
- ix) If radiologist has inserted stomal catheter, performer may supply adhesive and/or toweling to hold stomal catheter in

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place. May attach tubing of enema container to stomal catheter. May assist while radiologist adjusts stomal device so that it is held in position between buttocks.

x) Once rectal tip has been inserted, performer brings patient's buttocks together firmly and tapes buttocks together without touching catheter.

xi) Performer holds tube in place and turns patient to supine or prone position as ordered, or assists. Performer adjusts underpadding and adjusts tubing to ensure free flow of enema mixture.

7. Performer assists radiologist with enema flow and fluoroscopy:

a. Removes gloves and washes hands as appropriate. May put on fresh gloves. Checks that patient and staff are properly shielded.

b. On signal from radiologist, performer may dim room lights. Turns on TV power switch. May go to control panels and operate brightness controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders.

c. Performer may stand to the right of radiologist and control the flow of the barium sulfate mixture as ordered. Opens clamp and reclamps as ordered. Checks that enema is flowing. Reassures patient and reminds child to retain enema.

d. If appropriate, lowers enema bag or can on orders (to relieve or change pressure). If appropriate, provides basin for patient to expel enema and relieve pressure. Carries out appropriate sanitary clean-up steps as required if there is soiling.

e. Performer may assist radiologist with fluoroscopy, spotfilming and/or video:

i) Operates exposure controls as ordered, or positions table, tube, or patient as ordered.

ii) If spotfilm attachment uses cassettes, performer may unload as used, identify, and insert additional cassettes, as described above, throughout procedure.

iii) May operate replay mechanism of videotape equipment as ordered.

iv) Depending on institutional procedures, performer may keep radiologist informed of cumulative exposure as shown on fluoroscope timer indicator.

v) Performer notes any orders for repeat of any part of fluoroscopic examination. Changes technical factors as ordered. Assists in continued examination as described above, repeating appropriate steps.

vi) Clamps enema tube when radiologist indicates that fluoroscopy and filling is completed.

f. When the radiologist informs performer that the fluoroscopic portion of the examination is over, performer notes orders for immediate overhead filming with enema retained. Notes whether standard views and positions are ordered and/or special views and positions. Notes orders for recumbent or sitting positions. May wait while radiologist holds infant in inverted position before filming.

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8. Performer carries out pre-evacuation filming as appropriate:

   a. Notes needed adjustment of technical factors from those used for scout film(s) to allow for any changes requested by radiologist in technique or positions and/or allows for presence of contrast medium. Resets technical factors as appropriate for next projection as described.

   b. Performer prepares patient for the final position ordered for the exposure. Makes sure that correct side is being positioned when appropriate.

      i) Encourages child to retain enema.

      ii) May explain or demonstrate to patient or staff member what is required. May obtain help in positioning.

      iii) Performer is careful to turn patient towards the enema tubing so as not to dislodge tip.

      iv) When positioning a patient with a balloon catheter in place, performer makes sure that the clamp is not lying over a part to be exposed or that patient is not lying on the clamp.

   c. For AP supine or erect positions performer proceeds as described above.

   d. For lateral recumbent projection of the pediatric large intestine, performer notes side of interest and whether patient is to be positioned in a true lateral recumbent position or is to remain supine with x-ray tube directed horizontally across table to cassette placed vertically.

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      i) For a lateral recumbent projection, performer immobilizes patient's upper and lower extremities as described, and turns patient on to the side of interest, or has this done. Cushions neck, chin, and head, and keeps cheek level with the cassette. Uses tape, restraining bands or diaper across table to support and hold patient in position. Centers cassette in bucky (or on table under patient) to the iliac crest or as specified. Directs central ray vertically at right angles to film.

      ii) For supine positioning for a lateral projection, performer maintains patient in supine position as described. May elevate on radiolucent sponge or pad. Positions vertical holder on appropriate side or positions grid cassette vertically on table. Supports so that x-ray beam may be directed horizontally at right angles to film. May place wedge shaped pads or radiolucent sponges beneath neck; checks that head is in true AP position. Centers cassette to the mid-axillary line of the body at the level of the iliac crests or as specified. Directs central ray at right angles to film, centered to the area of interest.

      iii) For a lateral inverted film of the infant abdomen (for imperforate anus), performer positions patient on radiolucent board as described earlier and secures in inverted position with staff member standing by. Positions upright

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cassette holder and horizontal x-ray beam for lateral projection as in (ii), above, centered to the area of interest. Makes sure no one is in line of beam. e. Repeats radiography for all the exposures ordered by radiologist, adjusting technical factors, tube, table, and/or position of patient or film holder as appropriate to each view ordered. Repeats identification, collimation, shielding, breath control, and exposure as above. f. Performer arranges to have spot films, overheads, and any cine film processed at once: i) May sign or have radiologist sign requisition sheet. ii) Checks that equipment is turned off. iii) With cassette spot films and overhead exposures, removes any markers for further use. Attaches ID card for use with flasher if appropriate. iv) With spot film camera, performer advances the film so that all exposures made will be wound on the take-up spool in the roll film cassette. Replaces dark slide on camera lens. Uses device to cut film and create a light shield. Resets counter and removes film cassette. v) With cineradiography, performer checks that cine camera is turned off and that the film transport mechanism has come to a complete stop. Unlocks and removes film magazine. vi) Performer arranges to have overheads, spot films and cine film processed at once if appropriate or decides to process personally.	vii) While films are being processed, makes sure that patient is comfortable and attended by nurse, radiologist, staff member, or self. g. When the overheads and spot films have been processed and returned, performer places on view boxes. May also hang scout and prior films. May give processed cine film to radiologist and set up cine projector and screen. Informs radiologist that radiograph(s) are ready for viewing. h. Performer makes note of radiologist's decisions regarding adequacy of the radiographs and further orders: i) Changes technical factors as ordered and assists with any continued fluoroscopy or spotfilming as described until radiologist indicates that fluoroscopic examination and pre-evacuation filming is completed. ii) For intussusception, notes whether radiologist decides to terminate or to continue with therapeutic use of hydrostatic pressure. iii) For defecography, notes orders on placement of patient in position for defecation and orders for fluoroscopy, spot filming, cine and/or videotaping during defecation. iv) For barium enema study, performer notes orders for evacuation, post-evacuation radiographs, and whether a double contrast study will follow with instillation of air. v) Notes materials needed and provides any not already present.

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vi) If appropriate, has radiologist fill out or sign requisition order.

9. If radiologist will go ahead with therapeutic use of enema for intussusception, performer proceeds as follows:

   a. Performer notes whether radiologist wishes to have barium column reflux into enema for reuse, or, if there is enough fluid, use the remaining fluid in enema.

      i) If reflux of enema is decided on, performer lowers the enema bag from the pole, opens clamp, and instructs the patient to release the enema back into the lowered bag, or assists infant to do this.

      ii) Reclamps enema. Receives or asks for radiologist's order for pressure (such as enema height and/or mechanical setting). Hangs enema at appropriate height and/or sets mechanical pressure.

   b. Performer assists radiologist with fluoroscopy, videotaping, spot filming, positioning of table, patient, opening and closing of enema flow as ordered, as described above, until radiologist terminates application of hydrostatic pressure. Clamps enema when ordered.

   c. Notes orders for evacuation and post-evacuation films.

10. If performer will go ahead with defecography, proceeds as follows:

   a. Encourages patient to retain enema and positions for evacuation.

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      i) May place child in sitting position on a stool or chair fitted with pot and/or disposable bag.

      ii) If patient cannot be placed in sitting position, performer may attach disposable bag to patient, or supplies a radiolucent bedpan, or provides towels for infant patient.

      iii) Positions recumbent patient on side of interest, and raises head end of tilt table to appropriate angle as ordered.

   b. Performer may adjust image intensifier and x-ray tube(s) so that spot films can be taken from appropriate positions or assists radiologist.

   c. May try to relieve child's embarrassment if necessary. May darken room lights.

   d. On orders from radiologist, performer removes any tape from buttocks and removes enema tube.

   e. Performer assists with fluoroscopy, spot filming, and/or videotaping as described.

   f. Performer removes and disposes of bag, towels, bed pan or container after evacuation, using sanitary technique. Cleanses patient, self, and dons clean gloves if appropriate.

   g. Notes orders for post-evacuation films.

11. For barium enema study or after use of hydrostatic pressure, performer assists with evacuation and clean up as follows:

   a. If the enema apparatus involves a closed system disposable kit, performer lowers enema bag from pole

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and instructs child or assists infant to release the enema back into the lowered bag.

i) If air contrast study may follow, performer leaves bag hung in position below the level of the table.
ii) Otherwise removes tape and enema and discards enema as discussed below.

b. If the enema apparatus involves a retention balloon catheter, performer opens balloon lumen and allows air or water to drain. Removes tape. Uses paper toweling and gently removes the enema tip.

i) Assists child to descend from table and walk to toilet, or provides bedpan for patient to expel enema, towels for infant.
ii) Performer checks with any patient in toilet to make sure he or she is all right.

c. For patient with colostomy or ileostomy, performer lowers bag from pole and assists patient to sit on table, lean forward, and drain the barium mixture through the tubing into basin. May assist by massaging patient.
d. Performer cleans patient and any soiled equipment using sanitary technique. Provides patient with appropriate towels, cleansing solutions and fresh gown as appropriate. Replaces covering on table.

12. Performer proceeds to take post-evacuation radiographs at once as ordered:

a. Takes any projections ordered as described above, but decreases exposure factors to reflect decrease in frontal thickness of abdomen.

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b. Is careful not to dislodge rectal tip if left in place for later air contrast study.
c. Performer has post-evacuation radiographs processed and presented for radiologist's review as described above. Hangs all radiographs and spotfilms taken or processed as appropriate. Assists with videotape replay.
d. Notes any orders for air contrast enema with fluoroscopy and/or overhead filming. Provides any materials needed.

13. Throughout procedure performer remains alert for any symptom of severe pain or adverse reaction to contrast. As soon as performer judges that reaction may be severe, ceases exposure and notifies radiologist or other physician at once.

14. For air contrast study, performer may proceed as follows:

a. May prepare and check air insufflator if not already done.
b. If a disposable enema kit is being used and rectal tube is still in place, performer inverts the enema bag which is hung below the level of the table so that air will automatically rise.
c. If the enema tip has been removed, performer may prepare balloon catheter and air syringe and attach rectal tip and clamp, or has this done. May insert tip into patient's rectum as described above. Tapes buttocks together as described.
d. Performer assists while radiologist injects air through insufflator (or squeezes inverted bag) while checking on TV monitor.
e. Performer assists with fluoroscope controls, patient position-

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ing, tilt table and/or changing of spot film cassettes, as described above, as ordered.

f. Notes orders for overhead films.

  i) Performer makes overhead films as ordered with air enema retained, as described above or below. Adjusts technical factors to account for air contrast (decreased techniques from those used for barium enema).
  ii) If so ordered, performer may place patient or assist in placing patient in supine or lateral positions as described above.
  iii) Performer may position patient in prone position. If so, places patient on stomach, being careful not to dislodge enema tip. Arranges patient in PA position with face cushioned. Centers film to rectal area and directs central ray as ordered.
  iv) Performer may position patient in left or right PA oblique positions. If so, retains patient in prone position. Supports side opposite the side of interest so that pelvis is at appropriate angle with table. Centers film to rectal area and directs central ray as ordered.
  v) Performer has double contrast overhead films processed and reviewed at once as described.
  vi) When radiologist indicates that radiography is completed, assists with removal of enema and evacuation of air as described below.

15. When radiography has been completed, performer assists in termination procedures:

a. Washes hands and dons gloves. Removes any markers from patient's body.

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b. With disposable kit, if not already done, has patient expel air or liquid into bag.

  i) Performer gently removes tape and rectal tip.
  ii) Wraps apparatus in paper; drains contents into a toilet; and discards in appropriate receptacle.
  iii) Removes gloves and washes hands.

c. With conventional equipment, if not already done, performer removes tape and, using paper toweling, gently removes enema tip. Assists patient to toilet, supplies bedpan, or uses towels for infant.

  i) Empties bedpan contents into toilet. Performer removes any fecal masses from rectal tube with paper toweling. Discards in appropriate receptacle.
  ii) Rinses equipment and places for sterilizing or decides to do personally.
  iii) Removes gloves and washes hands.

d. With colostomy or ileostomy patient, performer may leave catheter in place and have nurse assist patient in lavatory to empty enema bag. Performer may supply clean pad or arranges to have clean dressings supplied or applied after patient or MD removes catheter. Removes gloves and washes hands.

e. May assist child from table. Reminds patient of any footrest in stepping off table. Makes sure that none of the equipment is projecting over the patient before allowing patient to rise from stool or table, and assists.

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f. Performer has patient cleansed; may have room and equipment cleaned with disinfectant. Has any other appropriate clean up procedures followed to avoid infection or contamination, or decides to do personally, depending on institutional arrangements.
g. May, if so ordered, arrange to have patient given food and drink immediately.
h. If radiologist orders delayed films, performer may make sure that patient will be taken to appropriate waiting area or returned to room and brought back to department at appropriate time.
i. Performer may have patient transported back to room, or to next location, or decides to do personally, as ordered. Makes sure that patient is in the care of a staff person who will transport to appropriate next location.
j. Performer records the examination according to institutional procedures. May include date, room, examination type, the overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each spot film and overhead view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.
k. Performer may record the fluoroscopic examination including exposure time and rad dosage using posted information.
l. May present requisition form to radiologist for comments and signature including orders for delayed films.

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m. Performer may decide to jacket radiographs, requisition sheets, and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures.
n. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

TASK DESCRIPTION SHEET

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1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected and set for fluoroscopy,overheads;scout taken;radiologist assisted with puncture,positioning,fluoroscopy;overhead radiographs,delayed films taken as ordered,processed,presented,repeated as ordered;pt. returned; examination recorded;radiographs placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet medical-technical history,prior films;view boxes;pen; x-ray generator,control panels,tube,bucky,table,collimator;fluoroscopy unit,image intensifier,TV monitor;cassettes;extension cones;R-L,ID markers;sterile procedure tray with iodine based contrast,syringes, dressings,scissors,forceps,puncture needles,specimen container,label;emergency cart;lead shielding;gloves gowns,masks;calipers;wax pen;forms;phone;immobilization devices,head clamp,band,tape,gauze,pillowcase, stockinet;diapers;padding;towels;pacifier,toys;intercom;basin;technique,standard view,tube rating,rad exposure charts;phantom,test object;stretcher

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant conditions; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Pediatric pt.;radiologist;nurse;accompanying adult; co-worker

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking percutaneous peritoneograms/herniograms of pediatric pt. by reviewing request;preparing equipment,pt.;measuring;setting up for fluoroscopy;taking scout films;assisting with puncture,injection of contrast,fluoroscopy;rocking pt.;setting technical factors;identifying films;providing shielding;collimating;taking overheads as ordered at proper times;arranging for processing;taking to radiologist;continuing,repeating as ordered for delayed film;having pt. returned;placing radiographs for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a patient scheduled for positive contrast inguinal herniography/peritoneography (radiography of the contents of the abdominal peritoneum after injection of contrast medium) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior plain film (s) and/or prior contrast films.

1. Performer reads the requisition sheet to determine the examination called for, purpose, the patient involved, special considerations, and to check the completeness of the information provided:
   a. Performer checks the examinations called for and the purpose; notes whether unilateral or bilateral study is involved, site and area of interest, whether excretory urography is planned.
   b. Notes the name of the radiologist in charge; may note the name of referring clinician.

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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c. Performer reads patient's name, identification number, sex, age, height and weight. Notes whether patient is in-patient, out-patient, or emergency patient.

d. Notes whether patient has prior history of allergies, results of any prior allergy test, adverse reaction to contrast.

e. Notes any special information that would affect patient positioning, technique, immobilization, or handling of the patient, such as presence of IV drip, oxygen supply, or similar life support devices; notes whether patient will arrive on stretcher. Checks whether isolation technique is required for patient with communicable or infectious condition or neonate. Notes whether patient may be accompanied by nurse, other staff person, parent or guardian.

f. If patient's record indicates orders for prior sedation, administration of antihistamine or other medication, prior administration of cleansing enema, or period for withholding of food or fluid, performer may check that orders were carried out and with proper timing. If not carried out properly, may arrange to delay examination until orders are carried out, or plans to inform radiologist.

g. May note infant's feeding schedule and arrange to have patient fed while in department if not contrary to needs of examination.

h. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, and the examination ordered. Plans to take special precautions with infant or ill patient such as use of gown, gloves, mask, isolation procedures to protect patient from contamination or to prevent spread of infection. Notes when shielding is applied in examination.

i. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

    i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examintion has been done at institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention. Notes any record of technical factors used for prior films.

    ii) If excretory urography is ordered, performer may note whether urograms have been made in recent past and plans to report this to radiologist.

    iii) If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer plans to bring this to attention of radiologist in charge. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

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j. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary:

   a. Washes hands as appropriate. May prepare for isolation technique.
   b. Checks that procedure tray for the examination has been properly prepared or decides to do personally:

      i) Checks that materials of various sizes are present for percutaneous injection of contrast solution. May check for emesis basin and towels.
      ii) Checks for appropriate iodine-based aqueous contrast solution and examines for chemical deterioration.
      iii) May check that label and sterile container for peritoneal fluid specimen is prepared or decides to do personally.

   c. Checks that emergency cart is present or available.
   d. Checks that proper accessories are available for procedure including leaded rubber shielding, aprons, and gloves to be used by performer, radiologist, the patient, and/or anyone who will remain in the room during exposure.

      i) Checks for hospital gowns, masks, gloves to be worn for sterile procedure.

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      ii) Checks that appropriate immobilization devices for infant or child are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient.
      iii) Checks that clean pacifiers and toys are present.
      iv) May set up footboard at end of tilt-table, and attach hand holds. May check that technical equipment has grid or high speed bucky.
      v) If a grid will be used with the image intensifier for fluoroscopy and/or spot filming, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.
      vi) Makes sure that right (R) and left (L) markers are available for use and identification cards or leaded numerals or markers.

   e. For overhead filming, performer makes sure that an adequate supply of loaded cassettes are available in the examination room. Selects appropriate speed and type of film, grid, and cassette combination depending on whether a bucky or table top technique will be used and standard institutional practices. Selects size based on patient's size and area of interest. If adequate supply is not in room, arranges to obtain or decides to obtain personally.
   f. Performer prepares for identification of overhead films using equipment provided by institution:

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i) May obtain lead numerals and tape and prepare identification strip for placement on cassettes giving appropriate patient identification information.

ii) Performer may prepare for use of flashcard by checking that there is piece of lead on cassette surfaces; may write or type out ID information on card if not received with requisition.

iii) Checks identification against requisition sheet.

3. Performer reviews and preselects technical exposure factors for overheads and fluoroscopy based on standards set for pediatric patients by the institution for the examination:

a. Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.

b. Performer reviews the technique chart(s) for the unit(s) to be used:

i) Locates information for the pediatric views involved. Takes note of the exposure factors to be used for overheads and fluoroscopy. Considers preferences of the radiologist involved, conversions needed to account for patient's age, condition, any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

ii) Performer looks up numerical conversion factors and calculates or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.

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iii) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

c. At the control panel, performer makes sure that indicator light shows that x-ray generator is "warmed up" and ready for use. Makes sure that all circuits have been stabilized. If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

d. As appropriate, performer sets x-ray generator mode selector(s) to fluoroscopic mode,and/or for over-head filming as appropriate.

e. If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

f. If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

g. Performer selects and sets exposure factors for fluoroscopy:

i) Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination.

ii) If mA is automatically controlled according to patient

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thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved.

iii) Sets fluoroscopic examination timer to maximum position.

h. If not already done, performer may set up x-ray and fluoroscope tube (s), image intensifier, collimator and accessories, as appropriate:

i) Makes sure that no one is in room.
ii) Places phantom or appropriate test object on radiography table where patient's area of interest will be centered for examination to prepare for check.
iii) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.
iv) If not already done, moves image intensifier and any spot film device into position; centers (over or under) the area of interest.
v) If not already done, centers any bucky/spot film tray to the anticipated area of interest.
vi) Performer adjusts the x-ray tube to appropriate focal spot-object distance (target to object distance, TOD). For fluoroscopy, adjusts distance between focal spot and image intensifier (focal spot to film distance, FFD). Makes sure that TOD is 15 inches or more. Operates controls or manually moves the x-ray tube(s) into place. Checks the focal-film distance by reading indicator scale in the tube housing;

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adjusts up or down until the required FFD is obtained.
vii) Performer may collimate fluoroscopy tube (and x-ray tube used for spotfilming if different), depending on nature of the equipment and controls. Adjusts fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or sets shutter mode selector to automatic collimation.

i. To check fluoroscopy mode, performer enters remote control room or operates controls in examination room behind leaded screen:

i) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.
ii) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.
iii) Checks mA meter and notes whether appropriate reading is obtained.
iv) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.
v) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when

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maximum examination exposure time is reached.

j. After equipment has been checked, performer shuts and resets selected exposure factors. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

4. Depending on institutional procedures performer may bring requisition sheet, patient's chart, and prior films to radiologist; may bring or escort patient, accompanying adult and/or staff member to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready.

   a. If performer is to have patient readied in examination room, may proceed as follows:

      i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.
      ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.
      iii) Performer greets patient and any accompanying staff person and/or parent or guardian, and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.
      iv) Makes patient comfortable on table.
      If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.
      Performer may decide to assist child to table or has this done. May obtain help. Makes sure that no equipment is in the way or may be collided with by patient. If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table. May have nurse carefully place infant in supine position on table, or lifts patient carefully, supporting infant's head, and places on table.
      v) Makes sure patient is being attended and there is no danger patient will fall off table. Makes sure patient is never unattended.
      If patient has a life support system in place, such as respirator, cardiac or infusion equipment, makes sure that equipment is being monitored.
      vi) If not already done, has patient's clothing removed and has patient put in gown and kept warm as appropriate.
      vii) Answers patient's, parent's or guardian's questions honestly; attempts to reassure and develop confidence. Remains aware that patient and/or adult may

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be frightened and/or patient in pain. Performer explains to adult when asked medical questions that it is not appropriate for technologist to answer these; encourages adult to speak to physician.

viii) If not already done, performer checks that orders for prior preparation for study such as cleansing enema, abstinence from food, drink, prior medication have been carried out. Plans to notify radiologist if any orders have not been carried out.

ix) If not already done, questions patient or accompanying adult about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

x) Depending on institutional arrangements and condition of patient, performer may indicate to parent or guardian that he or she must wait outside of examination room or that he or she may remain in room to help reassure patient.

xi) Performer attempts to develop a warm interaction with patient so that infant or child remains calm during examination. May hold patient; may speak to patient in calm, gentle voice; may provide clean pacifier or toy. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of retardation. Is calm and gentle as possible.

xii) With child, performer may tell patient what will happen, and rehearses aspects of the procedure. Shows how x-ray unit and tilt-table moves and works. May indicate how child can help.

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xiii) Performer may encourage child to relax. Rehearses patient in suspending respiration (inhalation and/or exhalation) and relaxing. Performer may check patient's relaxation by keeping hand on patient's back to detect tenseness. Performer may judge time interval needed after cessation of respiration for patient to relax, and plans to adjust exposure timing accordingly.

xiv) Unless measurements have already been made, performer uses centimeter calipers to measure the thickness of the abdomen and/or pelvis in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film.
Performer may evaluate the patient's bodily habitus to estimate the position of the kidneys.
Notes whether the areas of interest are heavily covered by muscle or soft fat, whether the palpation points will be easy to find.
Records measurements for determining exposure factors for overheads. Has patient relax.

xv) Performer may have patient empty bladder. Has patient void in bathroom or provides bedpan. May decide to assist patient.

b. Performer may inform attending radiologist that patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films to radiologist.

i) If not already done, performer tells radiologist about any

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difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

ii) Performer may accompany radiologist to examination room and make introductions or greet patient and/or staff.

iii) May provide radiologist with gown,gloves,mask,lead apron and gloves.

c. If not already done, performer joins radiologist, patient and other staff in examination room.

d. During radiologist's review of requisition, prior radiographic materials and examination of patient, performer notes radiologist's orders:

i) If radiologist decides to terminate procedure, performer proceeds to termination steps described below. If appropriate, arranges to have proper forms filled out.

ii) If radiologist decides that additional preparatory steps are needed, performer may arrange to have these carried out and/or performer arranges to reschedule patient.

iii) Performer may note radiologist's decision on how to proceed; notes radiologist's orders for scout film, type of immobilization. Plans a "plain film" of the abdomen in standard AP position or as ordered.

5. If performer is to make a preliminary scout film of the abdomen, performer makes sure that patient is attended.

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a. Sets up equipment before positioning and immobilizing patient:

i) Performer obtains the appropriate size loaded cassette for the scout projection and attaches identification information to the cassette or table top.

ii) Places right or left marker on cassette or table top as appropriate to the study and projection or depresses appropriate R or L button for automatic marking.
If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette. If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
Performer may place patient's card into card tray for equipment using automatic film marking device.

iii) If a bucky is not being used, performer places cassette on table in approximate final position.

iv) If cassette is to be used with bucky (under table top or in upright holder) performer may manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

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v) Performer selects the exposure factors for the preliminary scout projection taking account of the measurements taken of the patient.
vi) Enters control room and sets controls for radiography mode.
vii) For conventional exposure control, performer selects milliamperage and chooses selectors for the correct focal size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.
viii) For automatic phototimed exposure control, performer selects and sets the category corresponding to the type of study and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets control corresponding to the field size (as listed on technique chart for phototiming). May select and set a kVp range button (if called for with the equipment) corresponding to the range for the examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.
ix) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustment of table and tube height, position, and collimator (unless these have already been set).

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x) Performer may return to overhead unit and set the focal-film distance (if not already done). Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

b. Performer has patient immobilized or does so personally:

i) May explain or demonstrate what is required for immobilizing and positioning. May obtain help or help co-worker.
ii) Performer may immobilize infant's arms by extending them and placing them along sides of head, next to the ears. May apply a sleeve made of a diaper, towel, pillowcase or orthopedic stockinet to hold arms so that sleeve holds arms above and behind head, one at each side. May apply a sleeve of stretch gauze or bandage to the pelvis. Wraps lightly to maintain patient in position.
iii) In positioning and immobilizing patient, performer remains alert to patient's respiration. Does not force patient into a position where any breathing difficulty increases.
iv) Performer centers part and keeps the long axis of the part parallel to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part.

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List Elements Fully	List Elements Fully
c. For a supine AP projection (posterior view) of the pediatric abdomen, performer centers patient in supine position on cassette or on table over bucky, or has this done: i) Has patient's arms immobilized above and behind head next to ears as described; has lower legs immobilized as described, or tapes legs together just above knees. ii) Performer adjusts patient so that median sagittal plane of body and head are centered to midline of cassette or table. iii) With infant, may turn head to one side. Gently extends head and neck and immobilizes with head clamp, webbing strap under chin, or sponges so that median sagittal plane of head is at right angles or parallel to cassette. May elevate patient's knees and place restraining band across legs. iv) With child, elevates patient's shoulders and knees so that patient's back is in contact with table. Supports. Adjusts shoulders and hips so that they lie on single transverse planes. May immobilize ankles. Has patient flex elbows and abduct arms. v) Performer centers the cassette at the level of the iliac crests unless otherwise specified. Makes sure not to use visual points of muscle or fatty tissue and palpates for the crest of the bone. For pelvis and upper thigh, centers at the level of the soft tissue depression above the greater trochanter. vi) Directs central ray at right angles to the midpoint of the film.	vii) Performer may give patient a clean pacifier and tapes this into position unless this would impair respiration. viii) If not yet completed, performer immobilizes patient in position. Places restraining bands, strips of gauze, and adhesive tape as needed. With infant, may use head clamp; may use clean diaper stretched across the table and over the patient's head. Avoids use of compression band across abdomen or chest. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions. ix) If, during positioning, patient shows signs of pain or distress, performer notifies radiologist at once and awaits orders. d. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the patient to the x-ray field, or centers the part to the film holder, and uses the collimator light to center the tube to the part. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube to provide better centering.

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e. Once the patient has been positioned and immobilized, performer adjusts the collimator so that a small unexposed border will appear around the edge of the film; collimates further so as to expose only the area of interest.

  i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.
  ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

f. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.
Makes sure that anyone holding the patient (if absolutely necessary) or remaining in room is supplied with lead gloves and apron and stays out of central beam as much as possible.

g. Performer may rehearse child in taking a deep breath, then breathing out and holding still, or observes infant patient's breathing, and plans exposure for the appropriate instant for the phase required (expiration unless otherwise ordered). Plans to start exposure after chest has begun to decline, timed so that exposure is made before inhalation begins.

h. Performer makes the exposure:

  i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

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  ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells child when to take a deep breath, breathe out, and hold, or observes patient's breathing and times exposure to the appropriate instant for the phase required. Activates exposure for expiration after phase has begun.
  iii) Performer initiates exposure by pressing hand trigger or exposure control button.
  iv) While exposure is underway, performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.
  v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
  vi) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure.
  vii) After exposure is completed, tells child and/or any adult with infant that he or she can relax.
  viii) After exposure performer returns to patient. Removes the cassette from the x-ray table or bucky. Removes any markers for further use.

i. Performer arranges to have the exposure processed at once or de-

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cides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

i) While films are being processed, makes sure that patient is comfortable and attended by staff person, parent, or self.
ii) Performer brings the processed scout film directly to the radiologist in charge, places on view box, and/or arranges to have viewed in darkroom. May display prior films as well. Informs radiologist that the scout film is ready.

6. During radiologist's review of requisition, scout, prior films and examination of patient, performer notes radiologist's final orders:

a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has orders for cleansing of patient and/or rescheduling filled out and signed as appropriate.
b. Performer notes whether radiologist requires a change in technical factors and/or patient positioning or centering for later overhead filming:

i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.
ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

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c. If radiologist will proceed, notes radiologist's final orders on sequence of examination and use of contrast and equipment:

i) Notes injection site.
ii) Notes orders on type and amount of contrast to prepare in syringes, sizes of needle, use of tubing, orders to have changes made in the materials provided. Arranges to provide or change any equipment or supplies as ordered by radiologist.
iii) Performer arranges to provide or change any equipment or supplies as ordered by radiologist.
iv) If required, resets technical exposure factors as appropriate for fluoroscopy and/or overheads. For overheads takes account of fact that contrast will be used.

d. If not already done, has patient urinate as described.

7. If performer is to assist with injection of contrast medium, washes hands, observing sterile technique as appropriate. May proceed as follows:

a. If not already done, may have syringes prepared with contrast medium (iodine based solution); may decide to do personally.
b. Performer may position and immobilize patient on examination table with puncture site exposed. May have puncture site prepared or carries out personally using sterile technique:

i) Swabs lower abdomen with antiseptic solution. May apply

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iodine solution twice, allow to dry, and then remove with alcohol.

ii) Covers surrounding area around midline near umbilicus with sterile towels.

c. May provide emesis basin and clean towels.

d. Informs radiologist when patient and materials are ready for injection of contrast solution.

e. If not already done, gives leaded gloves and apron to radiologist; places leaded curtain in place. May provide sterile garments,may open packet of sterile gloves and assist radiologist using sterile technique. May hand materials and supplies when asked.

f. If radiologist aspirates peritoneal fluid, performer may hold prepared test tube or container while radiologist ejects aspirated contents in syringe into it; or receives syringe with fluid. May arrange to have specimen prepared for laboratory or decides to do personally.

g. If radiologist is to check position of needle using fluoroscopy, performer makes sure patient and anyone else in room is shielded. May dim room lights. Turns on TV power switch. May go to control room and operate fluoroscope brightness controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders. May adjust position of table, fluoroscope unit, or patient as ordered.

h. After injection of contrast performer may assist radiologist to care for patient if there is nausea or vomiting. Reassures patient. Cleans patient. May provide damp cold towel to alleviate flushing

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symptoms. May assist with sterile dressing of puncture site. Removes shielding from abdomen.

i. Performer assists radiologist or nurse in turning patient to prone position on x-ray table; may help to rock patient gently from side to side to facilitate outlining of anterior surface of peritoneum. When ordered, raises head end of table 35° to 45° .

j. Notes amount of minutes that are to elapse and orders for overhead film.

8. Performer makes PA projection (anterior view) of the pediatric pelvis and upper thighs as ordered:

a. Maintains patient in prone position with table tilted as above. If not already done, removes shielding.

b. Waits appropriate amount of time before making exposure (about five minutes).

c. If not already done, resets technical factors as described, adjusting for use of contrast material and any changes ordered by radiologist. Identifies cassette as described.

d. For a prone PA projection (posterior view) of the pediatric abdomen (and scrotum) performer immobilizes infant's extremities as described.

1) Maintains patient in prone position on cassette or table. Supports thorax and feet. Cushions and rests head on forehead or cheek. Centers median sagital plane to midline. Has child flex elbows, place arms in a comfortable position. Supports ankles. May have child rest hands beneath chest. May

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support head and upper chest. Arranges shoulders and hips to lie on single transverse planes.

- ii) Depending on orders, centers cassette to the level of the iliac crests, at the level of the greater trochanters, third lumbar body, or as ordered.
- iii) Collimates to the area of interest as ordered.
- iv) Directs central ray at right angles to midpoint of film or vertically, as ordered.

e. Performer immobilizes, collimates, makes exposure and has radiograph processed and reviewed as described.

f. Throughout procedure performer remains alert for any symptom of severe pain or adverse reaction to the contrast. As soon as performer judges that reaction may be severe, ceases procedure and notifies radiologist at once.

g. If so ordered, performer may repeat overhead view after making adjustments required by radiologist and/or rocking patient as described. Works rapidly because of rapid absorption of contrast material from peritoneum.

9. Performer notes any orders to have patient play actively for one half or one hour,and notes order for AP projection of abdomen or kidneys for excretory urogram (if ordered).

a. If appropriate, performer may have patient taken to appropriate area for play and makes sure that patient will be returned at appropriate time. Informs staff of what is required.

b. Performer keeps track of time and makes sure patient is returned to examination room when appropriate amount of time has elapsed.

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c. For a supine AP projection (posterior view) of kidneys, performer positions patient as for scout film, centering to the level of the iliac crests or estimated location of kidney on side of interest.

- i) If centering has not been indicated by radiologist, performer judges the location of the kidneys based on the patient's type of body (habitus) and the evidence of any prior films. Plans to adjust for higher centering for obese, hypersthenic patient, and lower centering for thin, asthenic patient.
- ii) Performer may direct central ray at 5° cephalad to the midpoint of film, may lower head end of table 15° to 20° and direct central ray at right angles to midpoint of film,if ordered.
- iii) Makes sure that patient has gonadal shielding in place.

d. Brings delayed urogram to radiologist as soon as processed.

- i) Notes any orders for additional views of kidneys, voiding urethrography, and/or post voiding films.
- ii) Notes appropriate shielding.
- iii) May have radiologist fill out requisition sheet for urography.
- iv) May plan to continue with urography or arranges for orders to be carried out at appropriate time.

10. When performer is told by radiologist that the examination has been completed, performer carries out termination steps for the examination:

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a. May have patient fed when appropriate.

b. Performer may have patient cleansed. Removes any markings from patient's body.

c. May decide to assist child from table. Makes sure patient is reminded of any footrest in stepping off table. Makes sure that none of the equipment is projecting over the patient before allowing patient to rise from table, and assists patient.

d. Performer may have patient transported back to room, recovery area, to parent or guardian, or to next location, or decides to do personally, as ordered. Makes sure that patient is in the care of a staff person who will transport to appropriate next location.

e. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed to avoid infection or contamination, or decides to do personally, depending on institutional arrangements.

f. May check that peritoneal fluid sample has been prepared for laboratory, is properly identified, or decides to do personally. May present lab. order form to radiologist for signature.

g. May present requisition form to radiologist for comments and signature. May present orders for delayed films for signature.

h. Performer records the examination according to institutional procedures. May include date, room, examination type, the overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each overhead view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.

i. Performer may record the fluoroscopic exposure including exposure time and rad dosage (using posted information).

j. Performer may decide to jacket radiographs, requisition sheets, and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures.

k. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

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1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;scout taken;equipment set up;technical factors selected and set;radiologist assisted with test dose,infusion or injection of contrast;series of postinjection, voiding and/or postmicturition urograms each taken as ordered,processed,presented for review;pt. returned;examination recorded;urograms placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, medical-technical history,prior films;view boxes;pen; x-ray generator,control panels,tube,bucky,table,collimator;extension cones;cassettes;vertical cassette holder;radiolucent platform;stool;cassette changer; basin;urine receptacles;bedpan;R-L,ID,series markers; sterile procedure tray with iodine based contrast,IV equipment,syringes,needles,antiseptic,feeding bottles,carbonated beverage;emergency cart;sterile gown, gloves,mask;voiding chair;clock;calipers;marking pen; waterproof table covering;balloon compression device; forms;tourniquets;towels;phone;immobilization devices,head clamp,band,tape,gauze,pillowcase,stockinet,diapers;padding;shielding;pacifier,toys;intercom; technique,standard view,tube rating,rad exposure charts;stretcher;incubator

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(x) No...( )

4. **If "Yes" to q. 3:** Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Pediatric patient;accompanying adult;radiologist;coworker;nurse

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking excretory intravenous inferior vena cavograms and urograms of pediatric pt.,by reviewing request; preparing equipment;preparing,reassuring,measuring pt.;taking scout;assisting with test dose,injection or infusion of contrast;setting technical factors; identifying film;positioning pt.;providing shielding, collimating;taking inferior vena cavogram,series of postinjection,voiding and/or postmicturition urograms as ordered;arranging for processing;presenting for review as taken;continuing as ordered;having pt. returned;placing radiographs for use;recording.

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Performer receives or obtains the x-ray requisition form, patient identification card, and any appropriate medical-technical history for a pediatric patient scheduled for intravenous pyelography (IVP, excretory method of urography of kidneys, ureters and bladder after injection of contrast medium into a vein) with possible orders for prior inferior vena cavography as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.
e. Decision of radiologist to proceed to excretory urography (possibly including voiding urethrography) after having conducted percutaneous peritoneography/herniography.

Performer may also receive prior scouts, urograms, and/or record of exposure technique(s) used.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, and to check the completeness of the information provided:

   a. Performer checks the examination called for, the purpose, and the areas involved:

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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i) Performer notes whether a routine IVP is ordered with routine scout film to be taken.

ii) Performer notes whether inferior vena cavography is ordered.

iii) Performer notes whether patient has already been injected with contrast, such as during peritoneography, immediately before examination. If so, notes timing, projections, areas of interest and whether voiding films are required, and proceeds directly to preparation of patient and filming.

iv) Notes whether contrast will be introduced by hypodermic injection, IV infusion, whether minute sequence filming is ordered. Notes whether area of interest is localized, whether films of urethra may be required. If so, whether voiding, post-evacuation.

v) Notes side of interest.

b. Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is in-patient or out-patient.

c. Notes the name of the radiologist in charge; may note the name of referring clinician.

d. Notes whether patient has prior history of allergies, results of any prior allergy test, adverse reaction to contrast. Notes whether test will be administered as part of procedure.

e. Notes any special information that would affect patient positioning, technique, immobilization, or handling of the patient, such as presence of IV drip, oxygen supply, or similar life support devices; notes whether patient will arrive on stretcher. Checks whether isolation technique is required for patient with communicable or infectious condition or neonate. Notes whether patient may be accompanied by nurse, other staff person, parent or guardian.

f. Performer notes any orders for prior preparation of patient:

i) Notes whether sedation, antihistamine or other medication is ordered prior to procedure, and proper timing.

ii) Notes, for inferior vena cavography, whether an intravenous drip of saline for infant has been started.

iii) Notes whether withholding of food, liquids, use of cleansing enema has been ordered and proper timing.

iv) Notes in-patient's regular feeding schedule.

v) Performer may check that orders were carried out and with proper timing. If not carried out properly, may arrange to delay examination until orders are carried out, or informs appropriate staff member.

iv) May arrange to have patient fed while in department at appropriate point in the examination. May have feeding bottle prepared.

g. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, and the examination ordered.

i) Plans to take special precautions with infant or ill patient such as use of gown, gloves, mask, isolation procedures to protect patient from

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contamination or to prevent spread of infection.

ii) With infant notes whether special radiolucent platform will be used for positioning patient, whether an automatic device to trigger exposure during voiding will be needed.

iii) Notes shielding appropriate for examination based on sex, age and positions ordered.

iv) Notes whether a carbonated beverage, and/or a compression paddle will be used.

v) Notes whether the use of a grid or bucky will be involved.

h. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention. Notes any record of technical factors used for prior films.

ii) If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer plans to bring this to attention of radiologist in

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charge. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

i. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary.

a. Washes hands as appropriate; depending on patient's condition, may arrange for or carry out isolation or decontamination techniques.

b. Checks that tray has been prepared for the study involved or decides to do personally:

i) Depending on patient's age and type of procedure ordered, performer checks that materials needed for injections and/or infusion are present in appropriate range of sizes, such as needles, IV equipment, tourniquets, syringes, local anesthetic.

ii) Checks that water soluble, iodine-based contrast solution is present, appropriate, and shows no chemical deterioration.

iii) If appropriate checks that carbonated beverage is available and cup or feeding bottle.

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c. Makes sure that emergency cart is present.

d. May make sure that examination table is provided with disposable and/or waterproof underpadding or decides to provide personally. If voiding study may follow, checks for proper collection equipment for urine depending on patient's age.

e. Checks that proper accessories are available for procedure including leaded rubber shielding, aprons, and gloves to be used by performer, radiologist, the patient, and/or anyone who will remain in the room during exposure.

   i) Checks for hospital gown, masks, gloves to be worn for sterile procedure.
   ii) Checks that appropriate immobilization devices for infant or child are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient.
   iii) Checks that clean pacifiers and toys are present.
   iv) May check for compression paddle, arm board, shaving kit.
   v) Makes sure that right (R) and left (L) markers are available for use, identification cards, or leaded numerals or markers, and markers to indicate post-injection time intervals and positions.

f. May set up footboard at end of tilt-table, and attach hand holds; may check that technical equipment has grid or high speed bucky; may set up examination platform for infant patient and make sure that it is warm.

g. Performer makes sure that upright cassette holder and an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Selects appropriate speed and type of film, grid and cassette combination depending on the techniques to be used and standard institutional practices. Selects size based on patient's size and area (s) of interest. If adequate supply is not in room, arranges to obtain or decides to obtain personally.

h. Performer prepares for identification of overhead films using equipment provided by institution:

   i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.
   ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may type or write out ID information on card if not received with requisition.
   iii) Checks identification against requisition sheet.

i. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

j. Performer checks that x-ray equipment is ready for use. Goes to control panel and checks that indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for the machine to "warm up." Makes sure

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that all circuits have been stabilized.

k. Performer may note whether a preliminary scout film has already been made of the patient (done earlier and/or by another radiologic technologist).

  i) If a scout film has already been made and viewed by radiologist, performer notes the technique used or ordered and plans technical factors, adjusting as appropriate.
  ii) If a scout film has been made but not approved, performer places processed scout film and any prior films with patient's chart or places on view box for review by the radiologist in charge.
  iii) If a scout film has not been made and is required before patient is seen by the radiologist in charge, performer plans to proceed after readying patient, as described below. Otherwise awaits orders from radiologist.

3. Depending on institutional procedures, performer may bring requisition sheet patient's chart, and prior films to radiologist; may bring or escort patient, accompanying adult and/or staff member to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready.

  a. If performer is to have patient readied in examination room, may proceed as follows:

    i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isola-

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tion or decontamination techniques. May don gown, mask, gloves.

    ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.
    iii) Performer greets patient and any accompanying staff person and/or parent or guardian, and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.
    iv) Makes patient comfortable on table. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.
    Performer may decide to assist child to table or has this done. May obtain help. Makes sure that no equipment is in the way or may be collided with by patient.
    If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.
    May have nurse carefully place infant in supine position on table or special platform on table, or lifts patient care-

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fully, supporting infant's head and places on table or platform.

v) Makes sure patient is being attended and there is no danger patient will fall off table.
If patient has a life support system in place, such as incubator, respiration, cardiac or infusion equipment, makes sure that equipment is being monitored.

vi) If not already done, has patient's clothing removed and has patient, especially neonate, put in gown and kept warm as appropriate.

vii) Answers patient's, parent's or guardian's questions honestly; attempts to reassure and develop confidence. Remains aware that patient and/or adult may be frightened and/or patient in pain. Performer explains to adult when asked medical questions that it is not appropriate for technologist to answer these; encourages adult to speak to physician.

viii) If not already done, performer checks that orders for prior preparation for study have been carried out. Plans to notify radiologist if any prior orders have not been carried out.
If not already done, questions patient or accompanying adult about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

ix) Depending on institutional arrangements and condition of patient, performer may indicate to parent or guardian that he or she must wait outside of examination room or that he or she may remain in room to help reassure patient.

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x) Performer attempts to develop a warm interaction with patient so that infant or child remains calm during examination. May hold patient; may speak to patient in calm, gentle voice; may provide clean pacifier or toy. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of retardation. Is as calm and gentle as possible. With child, performer may tell patient what will happen, may rehearse aspects of the procedure. Shows how x-ray unit and tilt-table moves and works. Performer explains truthfully if patient can be expected to feel any discomfort. Indicates how patient can help.

xi) Performer encourages non-infant patient to relax. Rehearses child in suspending respiration (inhalation and/or exhalation) and relaxing. Performer may check patient's relaxation by keeping hand on patient's back to detect tenseness. Performer may judge time interval needed after cessation of respiration for patient to relax, and plans to adjust exposure timing accordingly.

xii) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the abdomen (and pelvis if appropriate) in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. May evaluate the patient's bodily habitus to estimate the position of the kidneys and

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variations in location between recumbent and erect positioning. If both recumbent and erect positioning will be used, performer may measure or estimate thickness in both positions.
Notes whether the areas of interest are heavily covered by muscle or soft fat, whether the palpation points will be easy to find.
Records measurements for determining exposure factors for overheads. Has patient relax.

xiii) If not already done, performer may have non-infant patient empty bladder. Has patient void in bathroom or provides bedpan. May decide to assist patient.

xiv) Has patient relax on table in appropriate supine position for examination or for scout film, depending on whether orders require that a scout film be made before the radiologist's examination.

xv) If a scout film is ordered prior to physician's examination, performer arranges to make scout film at this point, as described below (in later steps); plans to have processed at once. Otherwise awaits orders.

b. Performer may inform attending radiologist that patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films or scout to radiologist. Displays radiographs on view boxes.

i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything

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else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

ii) Performer may accompany radiologist to examination room, greet or introduce patient and/or staff.

c. If not already done, performer joins radiologist, patient and other staff in examination room.

d. Performer may note radiologist's decision on how to proceed; notes radiologist's orders for scout film, type of shielding and immobilization. May note specific orders for area to be included in central beam. Plans a "plain film" of the abdomen in standard AP position or as ordered.

4. If performer is to make a preliminary scout film of the abdomen, performer makes sure that patient is attended.

a. Performer selects the technical factors for the scout film before positioning and immobilizing the patient.

i) Consults the technique chart posted for the machine. Locates the information needed for the body part and projection involved according to the centimeter thickness of the part and position as measured and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed and use of other accessories (such as screens, grids, bucky, etc.).

ii) Makes note of the kVp, mA, T(seconds of exposure time),

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focal spot size, and the focal film distance (TFD or FFD) called for.

iii) Once the standard kVp, mA and time have been determined, performer makes any conversions necessary to account for the patient's condition and age, the preference of the radiologist involved, and any other conversion needed such as posted changes.

iv) Performer looks up numerical conversion factors and calculates or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.

v) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

b. Performer sets the exposure factors as selected:

i) Sets controls for radiography mode.

ii) If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

iii) For conventional exposure control, performer sets the milliamperage selected for the correct focal spot size. Sets the selected exposure time that will produce the mAs desired. Sets

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the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

iv) For automatic phototimed exposure control, performer sets the category corresponding to the type of study and use of screens, bucky, etc., and, if appropriate, focal spot size. Sets a control corresponding to the selected field size (as listed on technique chart for phototiming).
May set a kVp range button, if called for with equipment, corresponding to the appropriate kV range for the examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

v) Depending on the equipment, may set controls to provide for use of bucky, manual table-side adjustments of table, tube height or position, and collimator.

vi) Performer may return to overhead unit and set the focal-film distance (if not already done). Operates controls or manually moves the x-ray tube into place over the film holder. Checks the focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

c. Performer places the cassette:

i) Performer obtains the appropriate size loaded cassette for the scout projection and at-

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taches identification information to the cassette or table top.

ii) Places right or left marker on cassette or table top as appropriate to the study and projection,or depresses appropriate R or L button for automatic marking.

If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette. If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette. Performer may place patient's card into card tray for equipment using automatic film marking device.

iii) If a bucky is not being used, performer places cassette on table in approximate final position. (May be under radiolucent platform.)

iv) If cassette is to be used with bucky,performer may manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.

d. Performer has patient immobilized or does so personally:

i) May explain or demonstrate to child or co-worker what is required for immobilizing and positioning. May obtain help or help co-worker.

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ii) Performer may have infant's body immobilized with extremities at sides by mummying (wrapping), or decides to do personally. If performer asks co-worker or nurse to do, indicates at what level sheet should be wrapped. May have infant immobilized on special platform.

iii) Performer may immobilize infant's arms by extending them and placing them along sides of head, next to the ears. May apply a sleeve made of a diaper, towel, pillowcase or orthopedic stockinet to hold arms so that sleeve holds arms above and behind head, one at each side. May apply a sleeve of stretch gauze or bandage to the pelvis. Wraps lightly to maintain patient in position.

iv) In positioning and immobilizing patient, performer remains alert to patient's respiration. Does not force patient into a position where any breathing difficulty increases.

e. For a supine AP projection (posterior view) of the pediatric abdomen, performer centers patient in supine position on cassette, on table over bucky, or on platform, or has this done:

i) May have infant's arms immobilized above and behind head next to ears as described; may have lower legs immobilized as described, or tapes legs together just above knees.

ii) Performer adjusts patient so that median sagittal plane of body and head are centered to midline of cassette or table.

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iii) Elevates child's shoulders and knees so that patient's back is in contact with table. Supports. Adjusts shoulders and hips so that they lie on single transverse planes. May immobilize ankles. May have child flex elbows and abduct arms.

iv) May turn infant's head to one side. Gently extends head and neck and immobilizes with head clamp, webbing strap under chin, or sponges so that median sagittal plane of head is at right angles or parallel to cassette. May elevate patient's knees and place restraining band across legs.

v) Performer centers the cassette at the level of the iliac crests unless otherwise specified. Makes sure not to use visual points of muscle or fatty tissue and palpates for the crest of the symphysis pubis. Keeps the long axis of the part parallel to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part. Includes the mid-symphysis pubis at the lower border of the area of interest unless otherwise ordered.

vi) Directs central ray at right angles to the midpoint of film.

f. Performer may give child a clean pacifier,and tapes this into position unless this would impair respiration.

g. If not yet completed, performer immobilizes patient in position.

i) Places restraining bands, strips of gauze, and adhesive tape as needed. With infant, may use head clamp; may use clean diaper str[illegible]ed across the table and

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over the patient's head.

ii) Avoids use of compression band across abdomen. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

iii) If, during positioning, patient shows signs of pain or distress, performer notifies radiologist at once and awaits orders.

h. Performer sets the focal-film distance if not already done as appropriate.

i. Performer may rehearse child in taking a deep breath, then breathing out and holding still, or observes infant patient's breathing and plans exposure for the appropriate instant for the phase required (expiration unless otherwise ordered). Plans to start exposure after chest has begun to decline, timed so that exposure is made before inhalation begins. Plans to use the same phase of respiration for all films unless otherwise ordered.

j. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the patient to the x-ray field, or centers the part to the film holder, and uses the collimator light to center the tube to the part. Checks that primary beam will enter the center of the

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area of interest at the selected angle to the film so as to project the view desired. May readjust tube position lengthwise or crosswise to provide better centering.

k. Once the patient has been positioned and immobilized, performer adjusts the collimator so that a small unexposed border will appear around the edge of the film; collimates further so as to expose only the area of interest.

   i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.
   ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

l. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.
Makes sure that anyone holding the patient (if absolutely necessary) or remaining in room is supplied with lead gloves and apron and stays out of central beam. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

m. When everything is ready for the exposure, performer reminds child of the cooperation and breath control to be used for exposure. Encourages patient to relax. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

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n. Performer makes exposure:

   i) Performer returns to control room. Makes sure controls are properly set, and that patient is still in position.
   ii) As rehearsed, tells child when to take a deep breath, breathe out, and hold, or observes patient's breathing and times exposure to the appropriate instant for the phase required. Activates exposure for expiration after phase has begun, waiting one or two seconds to allow involuntary movement of viscera to subside, and then makes exposure. Initiates exposure by pressing hand trigger or exposure control button.
   iii) While exposure is underway, performer may check that mA meter records appropriate current as set, that kVp meter dips slightly.
   iv) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
   v) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure.
   vi) After exposure is completed, tells child and/or any adult with infant that he or she can relax.
   vii) After exposure performer returns to patient. Removes the cassette from the x-ray table

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or bucky. Removes any markers for further use. o. Performer arranges to have the exposure processed at once or decides to do personally. i) Attaches ID card for use with flasher if appropriate. May sign requisition. ii) While films are being processed, makes sure that patient is comfortable and attended by staff person, parent, or self. iii) Performer brings the processed scout film directly to the radiologist in charge, places on view box, and/or arranges to have viewed in darkroom. May display prior films as well. Informs radiologist that the radiograph is ready. 5. During radiologist's review of requisition, scout, prior films and examination of patient, performer notes radiologist's decisions and orders: a. If radiologist indicates that procedure is to be terminated because there are contraindications, performer proceeds to termination steps as described below. If appropriate, arranges to have proper forms filled out and/or new requisition for other procedure made out and signed. b. If radiologist decides that the area under study is poorly visualized and that gas or feces must be cleared, performer may arrange to have radiologist's orders carried out: i) May arrange to have patient rescheduled, have radiologist sign requisition sheet. For out-pa-	tient may have instructions reinforced or decides to do personally. ii) May have gas clearing or cleansing procedures carried out at once or decides to do personally. iii) Once clearing or cleansing procedures are carried out, performer may repeat scout filming as described above; presents to radiologist for review as described. c. If radiologist indicates that the scout film is not technically adequate, performer notes radiologist's orders for change in technical factors, patient position, x-ray tube position, and/or centering of film. i) Notes whether need to repeat is due to performer's own lack of attention so that performer can avoid future "retakes." If request for retake reflects malfunctioning equipment, performer reports malfunction to appropriate staff member. If request for retake reflects the preference for density or contrast of the radiologist, performer notes for future use to avoid future "retakes." ii) May make additional scouts as described in later steps or repeats as described above; presents for review until radiologist indicates that area is properly visualized. d. When scout film is judged adequate, and if radiologist decides to proceed, performer notes radiologist's orders on the conduct of the examination:

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- i) Notes whether a test dose of contrast will be administered.
- ii) Notes whether contrast will be administered by intravenous injection or infusion.
- iii) Notes whether inferior vena cavography will be done. If so, notes sequence of steps and makes sure that overhead can be taken at once after injection of contrast.
- iv) Notes entry site for injection or infusion (unless IV is already in place) and the immobilization necessary.
- v) Notes whether carbonated beverage is to be given, whether patient is to void if not already done.
- vi) Notes radiologist's orders for postinjection time sequence and areas of interest, patient positions, centering.
- vii) May note orders on amount of contrast or change of equipment or supplies, and injection site.
- viii) Performer may check to be sure what areas are to be included in the radiographs and what gonadal protection can be provided at each stage without interfering with diagnostic purpose of study.

6. Performer may assist with preparation of patient. May carry out any or all of the following:

   a. If so ordered, performer may prepare carbonated beverage in cup or sterile feeding bottle and has patient drink, feeds infant, or has this done.

   b. If not already done, may have patient void or assists as described earlier. If scalp vein is to be used for injection, may have patient shaved.

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   c. Performer sets technical factors for first post-injection overhead as described, adjusting for patient's position, radiologist's orders after viewing scout, and use of contrast material. Identifies first cassette as appropriate and places as appropriate, adjusting centering as ordered.

   d. May have syringes or IV bottle prepared with contrast medium (iodine based solution) or decides to do personally. May check to see that amount, appearance and temperature are appropriate.

   e. If intravenous infusion method is to be used, performer may set up IV infusion apparatus. Attaches bottle of prepared contrast solution to sterile IV tubing. Hangs at appropriate height on pole near patient with clamp in closed position.

   f. Arranges to provide or change any equipment or supplies as ordered by radiologist.

   g. Performer may position patient on examination table as appropriate for introduction of contrast and first overhead film. May have injection site prepared or decides to do personally.

      - i) May have patient wrapped (mummied) with vein in dorsum, forearm, hand, wrist or external jugular vein exposed, or decides to do personally.
      - ii) For antecubital fossa or foot vein injection, tapes extremity to pad or arm board in extended position. For external jugular injection places pad under neck; lowers head and extends neck gently, turning head away from side to be injected. Immobilizes head.

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iii) May swab entry site with antiseptic solution and cover surrounding area with sterile towels using sterile technique.

h. May provide emesis basin and clean towels. May inflate balloon paddle if patient is to be placed over this for compression.

i. Informs radiologist when patient and materials are ready for injection of contrast solution.

7. If performer is to assist with test injection and/or administration of contrast medium, washes hands, observing sterile technique as appropriate.

   a. If appropriate, performer opens packet of sterile gloves for radiologist, observing sterile technique.
   b. May assist as appropriate by handing materials and supplies asked for. May provide support for the extremity used for injection.
   c. Performer assists radiologist to care for patient if there is nausea or vomiting. Reassures patient. Cleans patient. May provide damp cold towel to alleviate flushing symptoms.
   d. With infusion technique, performer may periodically check that needle has not become dislodged and that the fluid is dripping at an even rate. If there are any problems, performer clamps tube and notifies an MD or RN at once.
   e. If so ordered, makes sure that patient is securely held and lowers head end of table.

8. If inferior vena cavography is to be carried out, performer may proceed as follows:

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   a. Notes whether lateral as well as supine AP projection is ordered, sequence of events, and side of interest, or whether bilateral views are ordered.
   b. Makes sure that cassettes are prepared and the next one is in position. Checks that exposure factors are properly set.
   c. May assist with application of tourniquets around each thigh.
   d. For single AP projection, may remove tourniquet on injected side when ordered. Then makes AP exposure at once, as described, collimating to include the inferior vena cava.
   e. If lateral projection(s) are also ordered, carries out AP projection as described:
      i) May then assist in replacing tourniquet on injected side.
      ii) Resets factors for lateral view and places cassette appropriately.
   f. For lateral view(s) of the pediatric inferior vena cava, performer notes side of interest and whether patient is to be positioned in a true lateral recumbent position or is to remain supine with tube directed horizontally across table to cassette placed vertically.
      i) For a lateral recumbent projection, performer immobilizes infant's upper and lower extremities as described, and turns patient on to the side of interest or has this done. Cushions neck, chin, and head, and keeps cheek level with the cassette. Uses tape, restraining bands or diaper across table to support and hold patient in position.

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Has child lie on side of interest with opposite side supported. May support lower thoracic region. Has patient flex knees comfortably. Places supports under and between knees and ankles. Has patient flex elbows, place lower hand under head, and has patient grasp side of table with opposite hand. Adjusts body in true lateral position. Centers cassette in bucky (or on table under patient) to the area of interest. Directs central ray vertically at right angles to midpoint of film.

ii) For supine positioning for a lateral projection, performer maintains patient in supine position as described. Positions vertical holder on appropriate side or positions grid cassette vertically on table. Supports so that x-ray beam may be directed horizontally at right angles to film. May place wedge shaped pads or radiolucent sponges beneath neck; checks that head is in true AP position. Centers cassette to the mid-axillary line of the body at the level of the center of the area of interest. Directs central ray at right angles to film, centered to the area of interest.

iii) Repeats collimation, shielding and exposure as described. Repeats on opposite side for bilateral views.

iv) Repeats processing and presentation for review to radiologist as described. Then proceeds as ordered.

9. For excretory urography performer continues as appropriate:

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a. Notes time that injection or infusion is completed and plans timing of overheads as ordered.
b. Keeps track of the time elapsed. If appropriate, makes sure that patient is in the care of a staff person who will observe patient's reactions or decides to do personally.
c. Throughout procedure performer remains alert for any symptom of severe pain or adverse reaction to the contrast. As soon as performer judges that reaction may be severe, ceases procedure and notifies radiologist or attending physician at once.
d. Plans to process each set of radiographs in series as soon as exposed and present to radiologist for review to avoid unnecessary radiography and to permit radiologist to revise orders to accommodate to patient's condition and the evidence on the radiographs.
e. Performer makes sure to include time-interval marker on each cassette.
f. If centering has not been indicated by radiologist, performer judges the location of the kidneys based on the patient's type of body (habitus) and the evidence of any prior films. Plans to adjust for higher centering for obese, hypersthenic patients, and lower centering for thin, asthenic patients.
g. May turn patient to prone position or assist radiologist or nurse. May assist in positioning patient over "paddle" balloon to provide compression of upper abdomen.
h. May give carbonated beverage to patient after injection if so ordered. May have infant fed when appropriate.

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10. Performer positions as follows or as described earlier depending on radiologist's orders:

   a. For supine AP projections (posterior views) of the kidneys and ureters, performer positions patient as for scout film, centering to the level of the iliac crests or to the estimated location of kidney on side of interest.

      i) Performer may direct central ray at 5° cephalad to the midpoint of film.
      ii) Performer may lower head end of table 15° to 20° and direct central ray at right angles to midpoint of film.

   b. For a prone PA projection (anterior view) of the kidneys, performer notes whether film is to be centered to the estimated level of the kidneys or to the iliac crests.

      i) Positions patient in prone position on table or platform (over balloon paddle compression device if so ordered).
      ii) With infant, immobilizes extremities as described. Supports thorax and feet. Cushions and rests head on forehead or cheek.
      iii) Has child lie in prone position on table with median sagittal plane of body centered to the midline. Has patient flex elbows, place arms in a comfortable position. Supports ankles. Rests patient's head on cheek or chin. May have patient rest hands beneath chest. May support head and upper chest. Arranges shoulders and hips to lie on single transverse planes.
      iv) Depending on orders, centers cassette to the level of the iliac crests or at estimated level of kidneys at about the third lumbar body, or as estimated from prior films, or as marked.
      v) Directs central ray at right angles to midpoint of film. Collimates to area of interest.

   c. Performer again checks for ability of child to relax, and repeats appropriate breathing instructions for the same phase of respiration. If different phase is ordered from that planned for series, marks cassette accordingly.
   d. Performer makes the exposure, timed appropriately, as described above. Arranges to have each pyelogram processed as soon as exposed.

      i) While films are being processed, performer makes sure that patient is comfortable and attended by radiologist or staff member. Refrains from commenting on the films or providing any interpretation to patient.
      ii) Places the films on view boxes as processed, in order, as they are taken. May hang scout and prior films. Informs radiologist as each processed film is ready for viewing.

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e. Performer notes radiologist's instructions after each film is reviewed. As appropriate, makes changes in timing, technical factors, patient positioning, projections, central ray and table angulation.

f. Notes orders for and timing of oblique projections of kidney(s), overheads of ureter(s), bladder, proximal urethra, voiding urethrograms, post-voiding films. If not already done, may arrange to have patient fed. Notes orders for projections, side of interest, angulation, shielding for each view.

11. Performer continues as ordered, depending on radiologist's orders after reviewing each radiograph as taken and processed:

a. For oblique projections of the kidneys, performer notes whether anterior oblique or posterior oblique projections are ordered, the side of interest or whether bilateral views are ordered.

i) For anterior (AP) oblique projections (posterior oblique views) performer starts with patient in supine position. For posterior (PA) oblique projections (anterior oblique views) performer starts with patient in prone position.

ii) For a left AP oblique projection (left posterior oblique view) performer rotates supine patient 40° to 45° and supports the elevated (right) side. Centers cassette to the upper lumbar vertebrae, adjusted for patient's body type, and somewhat

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higher than for right view, at about the level of the xiphoid process. Directs central ray at right angles to midpoint of film.

iii) For a right AP oblique projection performer positions patient similarly to (ii), above but on opposite side. Centers cassette somewhat lower than for left view.

iv) For PA oblique projections (anterior oblique views) performer positions prone patient with coronal plane of the upper lumbar vertebrae on side of interest centered to midline. Rests patient's head on cheek on side of interest with arm alongside body. Rotates body so that opposite side is elevated 45°. Supports elevated side. Centers film as described in (ii) and/or (iii) above. Directs central ray at right angles to midpoint of film.

b. If overheads of the ureter(s) and bladder are ordered, performer positions as described earlier or below, depending on radiologist's orders and standard procedures:

i) If radiologist orders AP supine projection of bladder and proximal part of urethra, performer positions patient in supine position as described, but may extend patient's legs so that anterior pelvic bones are tilted downward. Centers film a little above the upper border of the symphysis pubis. Directs central ray at 5° caudad to midpoint of film, or 15° to 20° caudad with patient who has loss of normal lumbar curve.

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List Elements Fully

ii) If radiologist orders PA prone projection of bladder and upper part of urethra, performer positions patient in prone position as described, but may direct central ray at 10° to 15° cephalad to enter a point somewhat distal to the tip of coccyx and exit a little above the upper border of the symphysis pubis.

iii) If radiologist orders oblique views of bladder, performer positions patient as described earlier, depending on view ordered and side of interest, but rotates body 40° to 60° as ordered. Centers the pubic arch on the side of interest to midline of table. Extends and abducts upper thigh. Directs central ray at right angles to midpoint of film or at 10° caudad as ordered.

iv) If radiologist orders lateral view(s) of bladder, performer notes whether posterior or anterior bladder wall is the area of interest. Places patient in supine position for view of posterior wall and in prone position for view of anterior wall. Uses vertical bucky or cassette holder with film centered to the level of the bladder a little above the upper border of the symphysis pubis.
Directs central ray horizontally across table at right angles to midpoint of film.
Reverses position of central ray and cassette for opposite side lateral view.

c. If voiding urethrograms are ordered, performer may attach a container or bag to collect urine to patient's perineum and thighs in preparation for voiding.

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i) Provides physician and anyone who will remain in room during voiding exposure with appropriate protective shielding.

ii) Performer may set up a rapid film changer and automatic equipment which triggers exposure on urine contact. May check that desired exposure time for voiding films is not longer than maximum time available with rapid changer unit. May tilt table towards foot end so that urine will flow towards perineal electrode.

iii) If rapid changer will be used, performer makes sure that planned exposure time does not exceed available capacity of unit. Sets equipment for non-automatic, intermittant exposure so that delays in filming can be adjusted to patient's voiding pattern. May set up for quarter format spot films if rapid changer will not be used.

iv) Places patient on appropriate sitting apparatus for voiding and arranges receptacle.

v) Performer positions patient as appropriate.

vi) On orders from physician or as predetermined, performer takes voiding cystourethrograms in positions described earlier or below as ordered. May reposition patient, operate film changer as appropriate.

vii) For an axial view of posterior surface of bladder and lower end of ureters, performer has child sit on side or end of table,or stool on table,so that posterior surface of each knee is in contact with the edge of the table or stool on which the cassette is placed.

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Centers median sagittal plane of body to midline of table so that transverse axis of film coincides as nearly as possible to midaxillary plane of the body.
Centers film to median sagittal plane of pelvis.
Supports feet. Abduct thighs and leans patient directly forward until symphysis pubis is in close contact with table or stool. Has patient grasp ankles to maintain position.
Directs central ray at right angles to film, centered to the lumbosacral region at the level of the greater trochanters.

d. If post-voiding films are ordered, proceeds as follows:

   i) If not already done, assists with removal of IV apparatus or has this done.
   ii) If not already done, has patient void. May massage infant to encourage voiding. Prepares towels to absorb urine.
   Assists child to descend from table and walk to toilet, or provides bedpan.
   iii) For post-micturition study, performer takes overhead(s) in position(s) ordered as described. Has films processed, and presents for review as described above.
   iv) For delayed films, performer may arrange to have patient taken to appropriate holding area. Keeps track of the time elapsed. Makes sure that patient is in the care of a staff person who will transport to appropriate location and return patient at appropriate time. Takes delayed

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films as appropriate as described above and presents for review.
   v) Notes any orders for delayed films of more than several hours and for termination of procedure. May have physician fill out and/or sign requisition sheet.

12. When performer is told by radiologist that the examination has been completed, performer carries out termination steps for the examination:

   a. Performer may have patient cleansed, fed. Removes any markings from patient's body.
   b. May decide to assist child from table. Makes sure patient is reminded of any footrest in stepping off table. Makes sure that none of the equipment is projecting over the patient before allowing patient to rise from table, and assists patient.
   c. Performer may have patient transported back to room, to parent or guardian, or to next location, or decides to do personally, as ordered. Makes sure that patient is in the care of a staff person who will transport to appropriate next location.
   d. Performer may have room and equipment cleaned; has urine removed with disinfectant; may decide to do personally.
   Disposes of urine left in basins or receptacles and discards disposable equipment following sanitary procedures. May have room aired or deodorized. Has any other appropriate clean up procedures followed to avoid infection or contamination, or decides to do

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personally, depending on institutional procedures. e. May check that any urine specimen has been prepared for laboratory, is properly identified, or decides to do personally. May present lab order forms to physician for signature. f. Performer records the examination according to institutional procedures. May include date, room, examination type, the overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each overhead view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet. g. May present requisition form to physician for comments and signature, any orders for delayed films. h. Performer may decide to jacket radiographs, requisition sheets, and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. i. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

TASK DESCRIPTION SHEET

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1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt.reassured,measured;films identified;technical factors selected and set for fluoroscopy,spotfilming,overheads:scout taken;assistance given with examination,positioning,fluoroscopy,spotfilming;overhead exposures made;radiographs sent for processing,taken to radiologist;procedures continued as ordered;pt. returned;examination recorded;radiographs placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen; x-ray generator,control panels,tube,bucky,table,collimator;fluoroscopy unit,image intensifier,spotfilm device,TV monitor;cassettes;roll film;extension cones;vertical cassette holder;sterile procedure tray with towels,antiseptic,sterile solutions,gloves swabs,lubricant,syringes,catheters,blunt needle or conical nozzle,gauze or millipore filter,butterfly sutures,tape,scissors,aqueous or iodized oil contrast;R-L,ID,numerical lead markers;emergency cart; wax pen;calipers;lead aprons,gloves,shielding;receptacle;immobilization devices,head clamp,band,tape, gauze pillowcase,stockinet,diapers;padding;pacifier, toys;technique,standard view,tube rating,rad exposure charts;phantom,test object;stretcher,wheelchair; intercom;forms

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. **If "Yes" to q. 3:** Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.;parent or guardian;radiologist;nurse;pediatrician;co-worker

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking genitograms or fistulograms of any patient for intersex, external fistula or sinus tract examination by reviewing request;preparing equipment; reassuring,measuring pt.;setting up for fluoroscopy, spotfilming;assisting with preparation of patient, fluoroscopy,spotfilming;setting technical factors; identifying films;providing shielding;collimating; taking overheads as ordered;arranging for processing, clean up;assisting with removal of contrast;having pt. returned;placing radiographs for use;recording.

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Performer receives or obtains the x-ray requisition form, patient identification card, and any appropriate medical-technical history for a patient scheduled for genitography or fistulography (radiographic contrast study of ambiguous external genital passages, vaginography, or external fistulae or sinus tracts to demonstrate extent or origin) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior plain or contrast films.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, and to check the completeness of the information provided:

   a. Performer checks the examination called for and the purpose; notes whether an intersex condition is to be investigated, or wound,external fistula or sinus tract. Notes location of external opening.
   b. Performer reads patient's name, identification number, sex, age, weight and height. Notes whether pa-

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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tient is in-patient, out-patient, or emergency patient.

c. Notes the name of the radiologist in charge; may note the name of the referring clinician; with pediatric patient notes whether pediatrician will be present.

d. Notes any special information that could affect patient positioning, technique, immobilization, or handling.

   i) Notes any prior history of allergic reaction to contrast or allergies.
   ii) Notes whether patient is suffering from heart disease, communicable or infectious condition, infirmity, incoherence.
   iii) Notes whether patient will arrive on stretcher or in a wheelchair, whether patient will be accompanied by nurse, other staff person, parent or guardian. Checks whether isolation technique is required for patient with communicable or infectious condition.
   iv) Depending on institutional procedures, performer may note whether non-pediatric female patient is pregnant, may review date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.

e. Performer notes any orders on type of equipment, contrast medium or supplies. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, and the examination ordered.

   i) Notes whether procedure will make use of fluoroscopy, spot-filming, overheads.
   ii) Notes whether a grid or bucky will be used; notes shielding appropriate for examination based on sex, age and area of interest.

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f. If patient's record indicates orders for prior preparation such as cleansing enema, abstinence from food and/or drink, prior sedation, administration of analgesic, lab tests, performer may note proper timing and may check that orders were carried out and at appropriate time.

   i) If not carried out,or not at proper time,may arrange to delay examination or informs appropriate staff member.
   ii) May note pediatric patient's feeding schedule and arrange to have patient fed while in department at appropriate point in the examination.

g. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete:

   i) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention. Notes any record of technical factors used for prior films.
   ii) If the performer determines that the request is not properly authorized, is incomplete,

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that sufficient information is lacking for performer to select technique or prepare for examination, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

h. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary:

   a. Washes hands as appropriate; depending on patient's condition, may arrange for or carry out isolation or decontamination techniques.
   b. Checks that sterile procedure tray has been prepared for the study involved or decides to do personally:

      i) Checks that iodized oil, or iodine based,water-soluble solution,and/or materials for sterile injection of air are present if so ordered,or checks that the range of contrast media among which a selection may be made are present. Checks appearance of media for chemical deterioration.
      ii) If appropriate, may heat contrast to room or body temperature using heating device.

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      iii) Checks that syringes with plugged needle or cone terminal, or fitted with teflon or polyethylene catheter or bulb catheter are present as ordered, or checks that a range of materials for instillation of contrast and occlusion of orifices are present.

   c. Checks that emergency cart is present or available.
   d. Checks that accessories are available appropriate to procedure and patient's age and sex, including leaded rubber shielding, gloves, and aprons, to be used by performer, the radiologist and/or anyone who will remain in the room during exposure; immobilization devices for adult or pediatric patient; clean pacifiers and toys for child; mattress, pads, pillows and/or blankets for comfort of patient.
   e. May attach footboard or stirrups, shoulder supports, and/or hand holds to table.
   f. Makes sure that right (R) and left (L) markers are available for use, identification cards, leaded numerals or markers, and markers to identify orifices to be opacified.
   g. For overhead filming performer makes sure that an adequate supply of loaded cassettes are available in the examination room. Selects appropriate speed and type of film, grid,and cassette combination depending on whether a bucky or table top technique will be used and standard institutional practices. Selects size based on patient's size and probable area of interest. If adequate supply is not in room, arranges to obtain or decides to obtain personally.
   h. Performer prepares for identification of overhead films using equipment provided by institution:

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- i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.
- ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may type or write out ID information on card if not received with requisition.
- iii) Checks identification against requisition sheet.

i. If spotfilming during examination will involve use of a cassette/bucky spotfilm device, performer checks that there is an adequate supply of appropriate size cassettes in room.

- i) If there is insufficient supply of cassettes, arranges to obtain or decides to obtain personally.
- ii) Performer carries out identification of the spotfilm cassettes as for overhead films.
- iii) Performer may use controls or manually pull out spotfilm bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Make sure clamps are closed. Moves cassette into appropriate "stored" position.
- iv) If R-L markers are to be used with spotfilming, performer tapes into place on image intensifier screen or plans to tape to patient's body.

j. If spotfilming will utilize a camera attached to image intensifier and roll film, performer checks film supply indicator to make sure that there is sufficient film in the roll film cassette.

- i) If there is insufficient roll film in camera, performer arranges to have roll film cassette loaded, or decides to do personally.
- ii) When loaded roll film cassette is obtained, performer checks loading in subdued light. Checks that end of film is cut correctly and is properly threaded and attached to takeup spool so that film unwinds appropriately. Checks that film is properly engaged in sprockets. Locks into operating position. If appropriate, cuts off excess film at exit port and removes. Attaches film cassette to camera and locks into place. Replaces camera cover.
- iii) If there is an adequate film supply, checks that film is properly loaded.
- iv) Performer advances film to compensate for any exposure of film due to installation or check.
- v) Removes dark slide from camera lens.
- vi) If not already done, performer writes or types a card with patient's identification information for use with spot film device. Inserts in slot in spot film camera as appropriate.

k. If a grid will be used with the image intensifier for fluoroscopy and/or spotfilming, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

3. Performer may review and preset technical exposure factors for overheads, fluoroscopy and spotfilming based on standards set by the insti-

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tution for the examination involved:

a. Dons protective leaded rubber garments such as aprons and gloves. Makes sure that no one is in examination room or control room.

b. Performer reviews the technique chart(s) for the unit(s) to be used:

   i) Locates information for the probable projections involved. Takes note of the exposure factors to be used for overheads and fluoroscopy.

   ii) Considers preferences of the radiologist involved, patient's age, condition, and any newly posted changes in technical factors (to reflect accomodation to a change in machine output or a policy decision) and decides whether factors must be converted.

   iii) If needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.

   iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time (especially for pediatric patient).

c. Performer makes sure that indicator light shows that x-ray generator is "warmed up" and ready for use. Makes sure that all circiuts have been stabilized. If appropriate, checks line voltage meter, and, if needed, turns compensator dial until needle is aligned properly on line meter.

d. As appropriate, performer sets x-ray generator mode selector(s) for overhead scout film, for later use of fluoroscopic mode, and use of spot film camera or cassette device.

e. Performer sets controls on image intensifier for spotfilm camera or cassette device:

   i) For spotfilm camera, performer selects and sets the rate (frames per second) for the camera according to standards set for examination.

   ii) For cassette spotfilming performer may select and set a standard spotfilm program providing for format combinations such as single, half, or quarter combinations on a single cassette and related spot film sizes. Selects program appropriate for examination or awaits orders from radiologist.

f. If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

g. If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

h. Performer selects and sets expected exposure factors for fluoroscopy:

   i) Selects and sets kVp at the standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination.

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ii) If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved.

iii) Sets fluoroscopic examination timer to maximum position.

i. If appropriate, performer selects and sets exposure factors for spot filming:

i) For conventional manual exposure control, performer selects and sets the appropriate spot film time for the examination.

ii) For automatic, phototimed exposure control, performer selects a density exposure control appropriate for the examination.

iii) Performer selects the appropriate mA for the examination and the focal spot size to be used.

iv) Performer selects and sets kVp by combining settings on one major and one minor kVp selector as appropriate for the examination.

j. Performer may preset the exposure factors for the first overhead projection anticipated. Makes sure that technique relates to the combination of film type and speed, focal spot size, FFD and use or nonuse of other accessories (such as screens, grid, bucky, etc.) and the probable thickness of the part and collimated film size to be used:

i) Sets controls for radiography mode.

ii) For conventional exposure control, performer selects milliamperage and chooses selectors for the correct focal spot size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

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iii) For automatic phototimed exposure control, performer selects and sets the category corresponding to the type of study and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size.
Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming).
May select and set a kVp range button (if called for with the equipment) corresponding to the range for the examination.
Sets a density selector corresponding to the usual (or special) requirements for the study.
Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

iv) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustment of table and tube height, position, and collimator (unless these have already been set).

k. If not already done, performer may set up x-ray and fluoroscope tube(s), image intensifier, collimator and accessories as appropriate:

i) Makes sure that no one is in room.

ii) Places phantom or appropriate test object on radiography ta-

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ble where patient will be centered for examination.

iii) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.

iv) If not already done, moves image intensifier and any spotfilm device into position, centers (over or under) the area of interest.

v) Performer adjusts the x-ray tube to appropriate focal spot/object distance (target to object distance, TOD). For fluoroscopy adjusts distance between focal spot and image intensifier (focal spot to film distance, FFD). Makes sure that TOD is 15 inches or more. Operates controls or manually moves the x-ray tube(s) into place. Checks the focal-film distance by reading indicator scale in the tube housing, adjusts up or down until the required FFD is obtained.

vi) Performer collimates fluoroscopy tube (and x-ray tube used for spotfilming if different), depending on nature of the field size anticipated for fluoroscopic examination, or sets shutter mode selector to automatic collimation. Manually sets collimator for the spotfilm field size to be used, or selects and sets field size control to be used for automatic collimation with programmed spotfilm cassette exposure sequence.

l. To check fluoroscopy mode, performer enters remote control room or operates controls in examination room behind leaded screen:

i) Turns on TV power switch controls as appropriate. Activates

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fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.

ii) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.

iii) Checks mA meter and notes whether appropriate reading is obtained.

iv) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.

v) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

m. To check spotfilm functioning, performer may move cassette or roll film into x-ray exposure field using appropriate controls:

i) Performer activates controls for spotfilm exposure. Notes whether cassette or roll film transport is operating appropriately. Notes whether exposure is terminated by phototimer or, if manual timer, in time set. If appropriate, releases spotfilm control after exposure.

ii) If equipment is operating appropriately, performer unloads cassette and reloads or advances roll film as appropriate. Moves bucky out of way until fluoroscopy is completed.

n. After equipment has been checked, performer shuts and resets for standard exposure factors. If per-

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former decides that any of the equipment is not functioning properly, performer informs appropriate staff member. May arrange for alternate unit to be used.

4. Depending on institutional procedures performer may bring requisition sheet, patient's chart and prior films to radiologist; may bring patient and accompanying adult and/or staff member to examination room; and/or may join radiologist, patient and other staff after informing radiologist that equipment is ready.

   a. If performer is to have patient brought to examination room, may proceed as follows:

      i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.

      ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done). Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.

      iii) Performer greets patient and any accompanying staff person and/or parent or guardian, and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

   b. Makes patient comfortable on table and talks with patient and/or adult.

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i) If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.

ii) If patient is in wheelchair may move patient in chair into position next to table. Makes sure that wheelchair is in locked position. Performer may decide to assist patient from wheelchair to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.

[illegible] If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.

iv) May have nurse carefully place infant in supine position on table, or lifts infant carefully, supporting infant's head, and places on table.

v) Makes sure pediatric patient is never unattended and there is no danger patient will fall off table.

vi) If patient has a life support system in place, such as incubator, respiration, cardiac or infusion equipment, makes sure that equipment is being monitored.

vii) If not already done, has patient's clothing removed and provides gown or drape. May assist patient or request assistance from nurse. Permits patient to keep covered until measurements are taken and until examination by radiologist. Makes sure infant is kept warm.

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viii) Answers patient's, parent's or guardian's questions honestly; attempts to reassure and develop confidence. Remains aware that patient and/or adult may be frightened and/or patient in pain. Performer explains to adult when asked medical questions that it is not appropriate for technologist to answer these; encourages adult to speak to physician.

ix) If not already done, performer questions patient or staff about preparatory procedures ordered. May question patient about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).
Performer may make sure that an out-patient has made arrangements to be escorted home and to postpone normal activities for the day.
If appropriate and not already done, performer questions nonpediatric female patient regarding possible pregnancy.

x) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer plans to inform radiologist at once and proceeds only with approval.

c. If not already done, performer explains to patient or adult what will be involved in the procedure:

i) Performer may explain what cooperation will be asked of adult or child patient. May describe procedure and what radiologist will be doing. Indicates what types of positions the patient will be asked to assume. May demonstrate how tilt table will be used and reassure that patient will be held safely.

ii) Depending on institutional arrangements and condition of patient, performer may indicate to parent or guardian that he or she must wait outside of examination room or that he or she may remain in room to help reassure patient.

iii) Performer attempts to develop a warm interaction with infant or child patient so that patient remains calm during examination. May hold patient; may speak to patient in calm, gentle voice; may provide clean pacifier or toy. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of retardation. Is as calm and gentle as possible.

d. Unless measurements have already been recorded, performer uses centimeter calipers to measure the thickness of the body in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film in the likely positions to be ordered for overhead filming.

i) Notes whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points are easy to find.

ii) Records measurements for determining exposure factors for overheads.

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iii) Performer may tape R or L marker to patient if appropriate for use in spotfilming.

iv) Has patient relax in supine or dorsal lithotomy position on examination table depending on whether examination by radiologist will follow and area of interest. Makes sure patient is draped and comfortable.

e. Performer may inform attending radiologist when patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, lab reports, and any prior films to radiologist. Displays radiographs on view boxes.

i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist.

ii) Performer may accompany radiologist to examination room; may greet or introduce patient and staff members.

iii) Dons protective lead shielding, hospital gown and gloves when appropriate.

f. During radiologist's review of requisition, prior films, and examination of patient, performer notes radiologist's orders:

i) Performer may be asked to assist with examination. Carries out appropriate sterile procedures; hands instruments and materials as appropriate.

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ii) When radiologist orders scout film (before or after examination) performer notes the patient position, projection, and central ray angulation ordered or plans to carry out appropriate standard procedure.

iii) Performer provides patient and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member, parent, or guardian will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

5. Performer makes a scout film of the area of interest such as the pelvis, abdomen, or other part involved based on radiologist's orders. Makes sure young patient is attended while performer prepares for exposure.

a. Sets up equipment before positioning and immobilizing patient.

i) Performer obtains the appropriate size loaded cassette for the scout projection and attaches identification information to the cassette or table top.

ii) Places right or left marker on cassette or table top as appropriate or depresses appropriate R or L button for automatic marking.

If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.

If patient identification information is to be entered by

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use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
Performer may place patient's card into card tray for equipment using automatic film marking device.

- iii) If a bucky is not being used, performer places cassette on table approximating final positioning.
- iv) If cassette is to be used with bucky (under table top or in upright holder) performer may manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or into bucky slot.
- v) Unless already done, performer selects and sets (or resets) the technical factors for the scout film, taking account of the measurements made of the patient. Makes any conversions necessary as described. Sets controls as described earlier.
- vi) Sets the focal-film distance (if not already done). Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD (TFD) is obtained.

b. Performer may have patient immobilized or does so personally:

- i) May explain or demonstrate to patient or staff member what is required for immobilizing and positioning. May obtain help or help co-worker.

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- ii) Performer may immobilize an infant's arms by extending them and placing them along sides of head, next to the ears. May apply a sleeve made of a diaper, towel, pillowcase or orthopedic stockinet to hold arms so that sleeve holds arms above and behind head, one at each side.
- iii) Smooths out any folds in sheets or covering under patient or has this done.

c. Performer centers part and keeps the long axis of the part parallel to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part.

d. For an AP dorsal lithotomy projection (posterior view) of the pelvis, performer adjusts infant, child or older patient in a supine position on table or has this done.

- i) Adjusts infant's legs in lithotomy position and supports. Has older patient abduct thighs and flex hips and knees over padded leg rests.
- ii) Centers median sagittal plane of body to midline.
- iii) Adjusts shoulders and hips so that they lie on single transverse planes. May have non-infant patient flex elbows and abduct arms. Immobilizes infant as described above. Abducts thighs to permit central ray to clear; may support each foot.
- iv) For vaginography, centers film to the upper border of the symphysis pubis or as ordered.
- v) Directs central ray at right angles to center of film or as directed.

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e. For a supine AP projection (posterior view) of abdomen, performer adjusts infant, child or adult patient in a supine position on table or has this done.

   i) Centers median sagittal plane of body to midline.
   ii) Has infant's arms immobilized above and behind head next to ears as described; may tape legs together just above knees, or applies band. Immobilizes head with head clamp, webbing strap under chin, or sponges so that median sagittal plane of head is at right angles or parallel to cassette. May elevate patient's knees and place restraining band across legs.
   iii) Has non-infant's shoulders and knees elevated so that patient's back is in contact with table, or elevates thighs. Supports. Has shoulders and hips adjusted so that they lie on single transverse planes. May immobilize ankles. Has patient flex elbows and abduct arms.
   iv) Centers film to the level of the iliac crests unless otherwise specified. Makes sure not to use visual points of muscle or fatty tissue, and palpates for the crest of the bone.
   v) Directs central ray at right angles to the midpoint of the film.

f. For any other part of body performer decides to position as for plain film of the area of interest.

g. Performer completes immobilization, collimation, shielding and arranges for proper breath control:

   i) Performer may give infant a clean pacifier and tape this into position unless this would impair respiration.
   ii) If, during positioning, patient shows signs of pain or distress performer notifies radiologist at once and awaits orders.
   iii) If not yet completed, performer immobilizes young patient in position. Places restraining bands, strips of gauze, and adhesive tape as needed. May use head clamp; may use clean diaper stretched across the table and over the patient's head. Avoids use of compression band across abdomen. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.
   iv) Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the patient to the x-ray field, or centers the part to the film holder, and uses the collimator light to center the tube to the part. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube position lengthwise or crosswise to provide better centering.
   v) Once the patient has been positioned and immobilized, perform-

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er adjusts the collimator so as to expose only the area of interest. Performer may attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.

vi) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

vii) If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination. If not already done, makes sure that anyone holding the patient (if absolutely necessary) or remaining in room is supplied with lead gloves and apron and stays out of central beam as much as possible.

viii) Performer may rehearse non-infant patient in breath control such as breathing in deeply, breathing out, and holding breath (suspended exhalation) when ordered, or observes infant patient's breathing and plans exposure for the appropriate instant for the phase required (expiration unless otherwise ordered). Plans to start exposure after chest has begun to decline, timed so that exposure is made before inhalation begins.

h. Performer makes the exposure:

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i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

ii) Returns to control panel. Makes sure controls are properly set and patient is still in position.

As rehearsed, tells patient when to take a deep breath, breathe out and hold, or observes infant's breathing and times exposure to the appropriate instant for the phase required. Activates exposure for expiration after phase has begun.

iii) Performer initiates exposure by pressing hand trigger or exposure control button.

iv) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.

vi) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure.

vii) After exposure is completed, tells patient and/or any adult with infant that he or she can relax.

viii) After exposure performer returns to patient. Removes the cassette from the x-ray table or bucky. Removes any markers for further use.

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i. Performer arranges to have the scout film processed at once or decides to do personally.

  i) Attaches ID card for use with flasher if appropriate. May sign requisition.
  ii) While the film is being processed and/or evaluated performer has patient relax or makes sure that patient will be attended while waiting as appropriate.
  iii) Performer brings the processed scout film directly to the radiologist in charge, places on view box, and/or arranges to have viewed in darkroom; informs radiologist that the radiograph is ready. May display prior films as well.

6. During radiologist's review of requisition, scout, prior films and examination of patient, performer notes radiologist's orders:

  a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has orders for cleansing of patient and/or rescheduling filled out and signed as appropriate.
  b. Performer notes whether radiologist requires a change in technical factors and/or patient positioning or centering for later overhead filming.

    i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.
    ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

  c. If radiologist will proceed, notes final orders on sequence of examination and use of materials and equipment:

    i) If not already done, gives leaded gloves and apron to radiologist. If appropriate, places leaded curtain in place.
    ii) Notes final decision on contrast medium (air, water soluble solution, or iodized oil), and amount. Adjusts or changes as appropriate. Checks for possible chemical deterioration if not already done. May have syringes prepared with contrast medium or decides to do personally, using sterile technique. May check to see that temperature is appropriate. Warms if needed. May apply sterile gauze or millipore filter to tip of empty sterile syringe using sterile technique.
    iii) Notes final decision on type and size of equipment to use to fill tract and occlude the orifice. Notes whether more than one opening will be opacified. Provides anything missing. May provide butterfly sutures if so requested.
    iv) Notes radiologist's orders for program and settings for spotfilming and sets or resets as appropriate. May arrange signals for exposure, changing of spotfilm cassettes, operation of exposure controls or table. Discusses sequence and timing for procedure.

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v) If so requested, performer may place patient in modified lithotomy position with hips and knees flexed or in other position requested. May place disposable padding under buttocks. Arranges to have perineal area or area surrounding orifice(s) cleansed as for urethral catheterization; arranges to do personally or assists, using sterile procedures.

vi) Arranges to provide or change any equipment or supplies as ordered by radiologist.

vii) Performer sets technical factors for first post-injection overhead as described, adjusting for patient's position, radiologist's orders after viewing scout, and use of contrast material. Identifies first cassette as appropriate and places in bucky; moves out of way until fluoroscopy is completed.

viii) Informs radiologist when patient and equipment are ready. May assist with radiologist's entry of tract with syringe or catheter, and occlusion of orifice.

7. Performer assists radiologist during instillation of contrast and fluoroscopic examination:

a. On signal from radiologist, performer may dim room lights. Turns on TV power switch. May operate fluoroscope brightness or spotfilm controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders.

b. Performer may operate tilt table on orders from radiologist; may assist in positioning patient as ordered.

c. Performer may assist radiologist with spotfilming. Operates exposure

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controls as ordered, or positions table, x-ray tube, or patient as ordered. If spotfilm attachment uses cassettes, performer may unload as used, identify, and insert additional cassettes, as described above, throughout procedure.

d. Depending on institutional procedures, performer may keep radiologist informed of cumulative exposure as shown on fluoroscope timer indicator.

e. Performer notes radiologist's orders for overheads of the first (or next) opacified opening:

i) If more than one opening will be opacified, performer may place lead marker (indicating the order of the occluded opening) on the dressing or the occluding device, or as indicated.

ii) Performer notes patient positions and projections required, area of interest, and angulation.

8. For overhead filming performer resets technical factors as appropriate for each projection ordered as described, and proceeds as follows:

a. When positioning a patient with a balloon catheter or other instruments in place, performer makes sure that clamp or opaque parts are not lying over or under the area of interest, and is careful not to dislodge instruments.

b. If a reflux of contrast occurs, performer may have patient's skin cleansed before proceeding with exposure.

c. Makes sure that correct side is being positioned when appropriate. May explain or demonstrate to pa-

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tient or staff member what is required. May obtain help in positioning.

d. For supine AP projection proceeds as described above for scout film.

e. For a lateral recumbent projection, performer proceeds as follows:

  i) Immobilizes infant's upper and lower extremities and turns patient on to the side of interest or has this done. Cushions neck, chin, and head, and keeps cheek level with the cassette. Uses tape, restraining bands or diaper across table to support and hold patient in position.
  ii) Has non-infant patient assume lateral recumbent position on side of interest. Has patient flex knees comfortably, and centers midaxillary line to midline. Places supports under and between knees and ankles. Has patient flex elbows, place lower hand under head, and has patient grasp side of table with opposite hand.
  iii) Centers cassette to the level of the midpoint of area of interest.
  iv) Directs central ray at right angles to midpoint of film.
  v) Reverses position of patient for opposite side view.

f. For a lateral view using supine positioning, performer maintains patient in supine AP position as described.

  i) May elevate patient on radiolucent sponge or pad. Positions vertical holder on appropriate side,or positions grid cassette vertically on table. Supports so that x-ray beam may be directed horizontally at right angles to film.

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Checks that patient is in true AP position.
  ii) Centers cassette to the midaxillary line of the body at the level of the area of interest.
  iii) Directs central ray horizontally across table at right angles to midpoint of film.
  iv) Reverses position of central ray and cassette for opposite side lateral view.

g. For anterior oblique projections (posterior oblique views) performer starts with patient in supine position.

  i) For a left AP oblique projection (left posterior oblique view) performer rotates supine patient to prescribed angulation and supports the elevated (right) side. May extend and abduct patient's upper thigh. Places arms in comfortable position with shoulders on a single transverse plane. Centers cassette to the area of interest. Directs central ray at right angles to midpoint of film.
  ii) For a right AP oblique projection performer positions patient similarly as in (i), above, but on opposite side. Directs central ray at right angles to midpoint of film.

h. For PA oblique projections (anterior views) performer starts with patient in prone position.

  i) Elevates the opposite side to the desired angulation and supports. Rests patient's head on cheek with arm in comfortable position. Has child or

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adult patient support self on forearm and flexed knee.

- ii) Centers film to the area of interest.
- iii) Directs central ray at right angles to midpoint of film.
- iv) Reverses patient to elevate opposite side for second exposure if bilateral views are ordered.

i. Performer repeats appropriate steps including identification of cassette, use of R-L markers, immobilization, collimation, breathing instructions, shielding and making exposure as described above.

9. Performer arranges for processing and review of spotfilms and each overhead view as taken:

   a. May sign or have radiologist sign requisition sheet.
   b. Checks that equipment is turned off.
   c. With cassette spotfilms and overhead exposures, removes any markers for further use. Attaches ID card for use with flasher if appropriate.
   d. With spotfilm camera, performer advances the film so that all exposures made will be wound on the take-up spool in the roll film cassette. Replaces dark slide on camera lens. Uses device to cut film and create a light shield. Resets counter and removes film cassette.
   e. Performer has overheads and spotfilms processed at once or decides to process personally.
   f. While films are being processed, makes sure that patient is comfortable and, if necessary, attended by radiologist, staff member, or self.
   g. When the overheads and spotfilms have been processed and returned, performer places on view boxes in sequence. May also hang scout and prior films. Informs radiologist that radiograph(s) are ready for viewing and makes note of radiologist's decisions:

      - i) Notes orders for change in technical factors, change in patient positioning, centering and/or tube or table angulation.
      - ii) Notes any decision by radiologist to inject more contrast and repeat any portion of the procedure for first and/or additional tract openings.

   h. Assists with any further use of fluoroscopy.
   i. May assist with injection of air for double contrast study.
   j. For further overhead exposures performer repeats appropriate steps including identification of cassette, use of R-L and orifice sequence markers, selection and setting of technique, positioning patient and equipment for focus-object-film alignment, collimation, shielding, breathing instructions, making exposure, and processing, as described above.
   k. Performer refrains from commenting on the films or providing any interpretation to patient. Assists with patient who may be experiencing severe pain.
   l. Performer shows subsequent radiographs to radiologist as processed. Continues as ordered.

10. Performer may assist when ordered with removal of contrast. Operates tilt table, fluoroscopic controls as ordered.

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11. When performer is told by radiologist that the examination has been completed, performer carries out termination steps for the examination:

    a. If delayed films have been ordered, explains appropriate timing and any prior preparation. With in-patient may arrange to have nursing staff in charge of patient's care informed. May provide requisition sheet and have radiologist fill out and sign.
    b. May allow patient to void in bedpan or toilet if appropriate.
    c. Removes any markers from patient's body. May have patient cleansed.
    d. May arrange to have infant given food or drink.
    e. May assist patient from table. Reminds patient of any footrest in stepping off table. Makes sure that none of the equipment is projecting over the patient before allowing patient to rise from stool or table, and assists patient.
    f. If appropriate, makes sure that patient is in the care of a staff person who will transport to recovery area, appropriate next location or, if out-patient, will arrange to discharge or send patient home (with escort if appropriate).
    g. May have room and equipment cleaned; has any other appropriate clean up procedures followed to avoid infection or contamination, or decides to do personally, depending on institutional procedures.
    h. Performer records the examination according to institutional procedures. May include date, room, examination type, the overhead views taken, the technical factors used, and film sizes. May record the number of spotfilms and overhead views taken including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.
    i. Performer may record the fluoroscopy examination including exposure time and rad dosage using posted information.
    j. May present requisition form to radiologist for comments and signature. May present forms or requisitions for later delayed films.
    k. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures.
    l. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

TASK DESCRIPTION SHEET

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1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected and set for fluoroscopy;scout films taken;radiologist assisted with puncture,catheterization;pt. and equipment positioned for automatic injection,single or biplane serial filming,magnification,subtraction technique; filming coordinated with injection;radiographs sent for processing,radiologist's review;procedures repeated,continued as ordered;examination recorded;radiographs placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen; computer control panel,cable, keypunch cards;gowns, gloves,masks;technique,standard view,tube rating,rad exposure charts;phantom,test object;x-ray generator (s),tube(s),control panel(s);fluoroscope unit,TV monitor;shielding;collimator(s);serial cassette changer(s);tilt table,extension;extension cones;grids; image intensifier;cassettes;R-L,ID device or markers;automatic injector;immobilization devices;pads; tape;ECG equipment;emergency cart;sterile procedure tray for puncture,catheterization,antiseptic,saline, anticoagulant,local anesthetic,iodine based contrast, disinfectant solutions,swabs,drape,syringes;stretcher;wheelchair;calipers,protractor;marking pen; head band;tourniquet;tubing

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. **If "Yes" to q. 3:** Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant conditions; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.;radiologist;anesthesiologist;nurse;co-worker

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking cerebral angiograms or venograms of any patient,by reviewing request;measuring,reassuring pt.; setting up for fluoroscopy,serial filming single or biplane,magnification,subtraction technique,automatic injection of contrast;making scout films;assisting with sterile puncture,catheterization procedure; identifying films;applying shielding;collimating; setting technical factors;positioning,immobilizing pt.;making serial films in coordination with injection;having films processed,reviewed;repeating,adjusting as ordered;assisting with termination;placing radiographs for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card,and any appropriate medical-technical history for a patient scheduled for cerebral angiography, or jugular fossa, cavernous sinus, orbital venography (radiographic contrast studies of the vascular systems of the brain) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s) with record of technical factors used.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for and the purpose. Notes whether percutaneous needle puncture or Seldinger catheter technique is to be used (for cerebral angiography); notes entry site if already selected. For venography, notes whether direct frontal

OK-RP;RR:RR

6. Check here if this is a master sheet..(X)

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vein puncture or retrograde injection of internal jugular vein will be used.

b. Notes name of radiologist in charge, names of other staff members to assist, examination room, time scheduled, and whether or when performer is to report for preliminary preparations.

c. Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is in-patient, out-patient, emergency patient.

d. Notes areas of interest, whether unilateral or bilateral opacification is anticipated, whether hand or automatic injection, single or biplane seriography is to be used, type of cassette changer, whether sequence for serial radiography will be computer controlled (possibly combining film sequence with program for automatic injection of contrast). Notes whether program(s) has been selected for control panel. Notes whether subtraction, magnification techniques may be ordered. Notes orders on sterile materials such as types and sizes of needles, catheters, guide wires, saline, antiseptic, anticoagulant, anesthetic solutions, iodine based contrast. Notes whether ECG monitoring has been ordered.

e. Depending on institutional procedures, notes whether performer is to set up equipment and/or prepare patient personally, or whether performer will join neuroangiography team in examination room.

f. Notes whether patient has prior history of allergic reaction to contrast or history of allergies.

g. Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as respiratory or heart disease, communicable or infectious condition, presence of IV drip, behavioral disorder; notes whether patient will be arriving on stretcher, wheelchair, will be accompanied by nurse, other staff.

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h. Performer notes whether there are orders on prior preparation of patient such as therapeutic diet, allergy test, lab tests, cessation of oral contraceptive, prior abstinence from morning meal, start of IV drip, prior administration of sedation, antihistamine or other medication. Notes appropriate timing and checks whether all procedures have been carried out and at appropriate time, that all reports are with patient's chart. If there is any problem, arranges to have procedures carried out, examination postponed to allow proper timing, reports problem to appropriate staff member, or plans to inform radiologist.

i. Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus. Reports problem to appropriate staff member or plans to inform radiologist.

j. Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or else-

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where in recent past, whether history of extensive radiography should be reported to radiologist.

k. May check that the type of equipment ordered is available in examination room assigned.
   If magnification has been requested, performer may check that the machine to be used has a fractional focal spot of appropriate size for direct magnification technique (i.e. 0.3 mm or smaller), and can operate with rapid cassette changer.

l. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment and the examination ordered.

   i) Notes appropriate sterile procedures required, appropriate shielding for the examination. Notes whether film processing equipment is available adjacent to procedure room.
   ii) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.
   iii) If general anesthesia may be given, may check that x-ray equipment is compatible for use with anesthesia equipment.

m. If referring physician has requested that prior films, scans and test results already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have these delivered.

n. If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or immobilize patient, or if performer considers

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that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

2. Determines what prior preparations will be needed, such as cleaning and preparation of equipment and accessories, proper dress, consultation with procedure room staff and rehearsal if so required. May carry out any or all of the following:

   a. Goes to appropriate room in the department for the type of examination involved and the equipment required, such as angiography suite, or room assigned on requisition sheet.
   b. If appropriate, arrives for rehearsal of procedure and notes steps in relation to those of others on staff.
   c. May decide to clean x-ray equipment or arranges to have this done.

3. Prepares ahead so as not to keep patient in examination room longer than necessary:

   a. Washes hands as appropriate.
   b. Reviews the technique chart(s) for the unit(s) to be used (single or biplane serial changer, fluoroscopy unit).

      1) Locates information for the views likely to be involved. Takes note of the exposure factors to be used for overheads and fluoroscopy. Considers preferences of the radiologist involved, conver-

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sions needed to account for patient's age, condition; notes any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

ii) Looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.

iii) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

c. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator(s) and checks that each indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for machine to "warm up."

i) Makes sure that all circuits have been stabilized. If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

ii) As appropriate, performer sets x-ray generator mode selector(s) to fluoroscopic mode, and/or for overhead filming as appropriate.

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d. Sets up fluoroscopy equipment:

i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.

ii) If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

iii) If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

iv) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position.

v) If a grid will be used with the image intensifier for fluoroscopy, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

vi) May adjust distance between focal spot and image intensifier (focal spot to film dis-

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tance, FFD). May check that TOD is 15 inches or more.

vii) Performer may collimate fluoroscopy tube depending on nature of the equipment and controls. May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or may set shutter mode selector to automatic collimation.

e. May check fluoroscopy mode. If so, operates controls in examination room behind leaded screen:

i) Places phantom or appropriate test object on radiography table where patient's area of interest will be centered for examination.

ii) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.

iii) If not already done, moves image intensifier into position; centers (over or under) the area of interest.

iv) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.

v) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.

vi) Checks mA meter and notes whether appropriate reading is obtained.

vii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.

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viii) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

ix) After equipment has been checked, performer resets standard exposure factors. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

f. If rapid cassette changer(s) will be used, performer may set rate that is standard for procedure and await radiologist's further orders. May cycle each unit to check operation. If so, makes sure that anode is not rotating.

g. Performer may set up and check automatic pressure injection equipment as appropriate to the type to be used (if any).

h. Performer places single or biplane rapid cassette changers into position next to examination table so that patient's head can be positioned for scout film(s). Performer may pull out radiolucent extension from table so that patient's head can be positioned over cassette changer but not pick up vibrations of changer during exposure.

i. Checks that proper accessories are available for procedure:

i) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure. Checks that appropri-

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ate shielding is available for placement between radiologist and the patient.

ii) Checks that appropriate immobilization devices for patient's age are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient. May arrange to have infant kept warm during procedure.

iii) If orders have been given for the computer program(s) to be used (giving the number of films to be taken, per second intervals, number of separate series, and possibly a program to coordinate with automatic pressure injection), performer arranges to have keypunch control card prepared or delivered and checked, or decides to do personally. When orders have been given and control card is ready, performer places control card as appropriate in control panel of computer.

iv) Checks that extension cones are available. May set up shoulder rests, hand holds on tilt table.

v) Makes sure that right (R) and left (L) markers are available for use and identification cards or leaded numerals or markers. Checks that equipment or device is available to number serial films, or checks that cassettes such as vacuum cassettes are prenumbered and are in numerical order. May prepare identification strip using tape and lead numerals giving appropriate ID information for placement on table or scout film cassette(s). Checks identification against requisition sheet.

vi) Performer makes sure that an adequate supply of loaded cassettes for rapid film changer (s) of the appropriate types and sizes are available in the examination room. Checks that these are loaded with appropriate speed and type of film and grid combinations depending on the projections and techniques to be used, type of equipment, and institutional practices. If adequate supply is not in room, arranges to obtain or decides to obtain personally.

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j. Performer notes whether ECG monitoring equipment (if ordered) and emergency cart are present. Notes who will be assigned to monitor.

k. May check that procedure tray for the examination has been properly prepared or decides to do personally.

i) Depending on radiologist's decisions on location and the type of surgical entry and instillation to be used, performer may check for appropriate types and sizes of puncture needles, tourniquets, catheters, syringes, scalpels, guide wires, forceps, dressings. Notes whether appropriate antiseptic, saline, anticoagulant and local anesthetic solutions are present.

ii) Checks that appropriate aqueous iodine based contrast solution is present. Checks that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool.

4. Depending on institutional procedures performer may bring requisition

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sheet, patient's chart, and prior films and scans to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready:

a. If performer is to prepare patient in procedure room, may proceed as follows:

i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.

ii) Performer has the patient brought from holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.

iii) Performer greets patient and any accompanying staff person and/or parent or guardian, and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

iv) Makes patient comfortable on table. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.

If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.

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Performer may decide to assist patient to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.

If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.

May have nurse carefully place infant in supine position on table, or lifts patient carefully, supporting infant's head, and places on table.

v) Makes sure patient is being attended and there is no danger patient will fall off table. If patient has respiration, cardiac or infusion equipment attached, makes sure that equipment is being monitored.

vi) If not already done, has patient's dentures, hair pins, spectacles, and any jewelry removed. Makes sure that all garments are removed down to below the neck or has young patient put in gown and kept warm as appropriate.

vii) If not already done, questions patient or accompanying adult about prior preparations and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

viii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

ix) If any preparatory procedures were not carried out, if pa-

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tient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

x) Performer answers patient's nonmedical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Attempts to develop a warm interaction with patient. May hold child; speaks to patient in calm, gentle voice. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

xi) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the skull at the level and in the direction in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors.
After measuring, has patient rest in as relaxed a position as possible. May observe whether patient is obese or has a short neck requiring special positioning or use of angle block under film.

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b. When performer has measured the patient, may preset technical factors for scout film(s):

i) Performer selects the exposure factors for the preliminary scout projection(s) as described taking account of the measurements taken of the patient.

ii) At control panel(s) sets controls for radiography mode. Selects milliamperage and chooses selectors for the correct focal size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

iii) Depending on the equipment, may set controls to provide for use of manual tableside adjustment of collimator, table and of x-ray tube height and position (unless these have already been set).

iv) Performer obtains the appropriate size loaded cassette for the scout projection and attaches identification information to the cassette.
Places right or left marker on cassette as appropriate to the study and projection or depresses appropriate R or L button for automatic marking.
Places identification information on appropriate corner of cassette or sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
May place patient's card into card tray for equipment using automatic film marking device.

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v) Places cassette on AP film changer or radiolucent extension where patient's head will be positioned. Performer may adjust table height to allow for appropriate placement of cassette on AP serial cassette changer or on radiolucent extension over changer so that top of cassette, changer and table are properly aligned.

vi) Performer may return to overhead unit and set the focal-film distance (if not already done). Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

c. Performer may inform attending radiologist that patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films to radiologist.

i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

ii) Performer may accompany radiologist to examination room, greet and/or introduce patient and staff members.

d. If not already done, performer joins radiologist, patient and other staff in examination room.

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i) Performer may note radiologist's decision on whether to proceed and what will be done. Notes radiologist's orders for scout film, type of immobilization.

ii) Plans "plain film(s)" of the skull in standard position or as ordered. May plan for AP and lateral exposures, simultaneous exposure if biplane equipment is to be used.

iii) May provide gown, gloves, mask, lead apron and gloves to radiologist.

iv) Performer provides patient and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

5. Performer makes scout films of patient as ordered:

a. Performer prepares patient for exposures:

i) Performer may have an infant patient's body and extremities immobilized at sides by mummying (wrapping), or decides to do personally. If performer asks co-worker or nurse to do, indicates at what level sheet should be wrapped.

ii) May explain or demonstrate to staff member or patient what is required for immobilizing. May obtain help in positioning.

iii) Performer positions patient's body in supine position on

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table with head lying on cassette placed over or on AP cassette changer. For lateral projection supports and raises head on a radiolucent sponge. Arranges body so that its median sagittal plane is centered to the midline of table. Supports any elevated parts. Has non-infant patient place arms in a comfortable position and supports ankles and knees. Arranges shoulders to lie on a single transverse plane.

iv) In positioning head, refers to standard reference lines. May use wax marker to draw in reference lines, or visualizes mentally. Has non-infant patient first relax muscles of neck and then moves head gently. Centers film to part and keeps long axis parallel to film holder.

v) Performer defines the median sagittal plane of the skull by referring to the sagittal line connecting nasion, acanthion and symphysis menti (mental point).
Marks or defines the infraorbitomeatal line by finding the line connecting the external auditory meatus and the infraorbital margin. May palpate to find infraorbital margin.
Defines the interpupillary line as the transverse line which connects the pupils of the eyes when the patient is looking straight ahead, with the nasion at its midpoint.

vi) In setting the tube angulation, measures the angles between the central ray and the reference lines on the patient's skull, such as infraorbitomeatal line. Checks skull rotation by measuring the angle between the horizontal plane or the verti-

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cal central ray and the median sagittal line.

b. For lateral view of cranium,places cassette in vertical film holder or lateral-view unit of single or biplane changer as close to the head on the side of interest as possible.

i) Adjusts patient in supine position with head raised on radiolucent support so that head is centered for horizontal projection.

ii) Adjusts in AP position so that median sagittal plane is at right angles to the extension board or surface on which head is resting, and parallel with the plane of the film. Extends head so that infraorbitomeatal line is at right angles to the horizontal plane.

iii) Centers cassette to a point slightly cranial to the auricle, midway between the forehead and the occiput, or centers to the mastoid process, at a point about 1 cm. cranial to and 2 cm. posterior to the external auditory meatus, depending on the area of interest.

iv) Directs central ray horizontally at right angles to midpoint of film or as ordered.

c. For an AP projection of cranium, performer removes radiolucent sponge unless simultaneous biplane exposures will be made. Places cassette under patient's head with patient in supine AP position.

i) Immobilizes head in same AP position as described above.

ii) Centers cassette to the median sagittal plane at the level of the area of interest.

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- iii) May define a line from the supraorbital margin and about 2 cm. above and anterior to the external auditory meatus. Directs central ray parallel to that line and 2 cm. cranial.
- iv) May direct central ray through the midorbits at about 20° cephalad, coinciding with a line passing through the nasion and a point about 2 cm. cranial to the auricle of the ear, or as ordered.

d. Immobilizes head using tape, sponges as appropriate.

- i) For infant, places restraining bands as appropriate using additional strips of gauze and adhesive tape as appropriate.
- ii) After patient has been immobilized, performer makes sure the patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.
- iii) Checks final positioning using protractor and light in collimator. Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows as reference for center of field, and uses the collimator light to center the tube to the part.
- iv) Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust x-ray tube position lengthwise or crosswise to provide better centering.

e. Once the patient has been positioned and immobilized, performer adjusts the collimator so as to expose only the area of interest as defined by radiologist.

- i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.
- ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

f. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination, such as eyes. Makes sure that anyone remaining in room is supplied with lead gloves and apron and stays out of central beam.

g. Performer may rehearse non-infant patient in holding breath and remaining motionless, or observes infant patient's breathing and plans exposure for the appropriate quiet phase such as after expiration.

h. Performer makes the exposure:

- i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.
- ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells patient when to hold breath, or observes infant's breathing and times exposure to the appropriate quiet phase required.

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iii) Performer initiates exposure by pressing hand trigger or exposure control button (or appropriate control for simultaneous biplane exposure).

iv) While exposure is underway, performer may check that mA meter records appropriate current as set, that kVp meter dips slightly.

v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.

vi) After exposure is completed, tells patient that he or she can relax. Returns to patient. Removes the cassette(s) and any markers for further use.

i. If single plane scout films in both AP and lateral projections are ordered (and if biplane equipment was not used), performer maintains patient in same position; removes radiolucent sponge if lateral will be followed by AP projection, or the reverse, and proceeds with second exposure as described.

j. Performer arranges to have the scout film(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

   i) While film(s) are being processed, makes sure that patient is comfortable and attended by staff person or self.
   ii) Performer brings the processed scout film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist when the radiograph(s) are ready.

6. During radiologist's review of requisition, scouts, prior films and examination of patient, performer notes radiologist's orders:

   a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.
   b. Performer notes whether radiologist requires a change in technical factors and/or patient positioning, centering, or central ray angulation for later serial filming.

      i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.
      ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

   c. If radiologist will proceed, notes radiologist's final orders on sequence of examination, use of contrast and equipment, injection of contrast, and serial filming.

7. Performer carries out preparations for angiography as ordered by radiologist based on the part of the work for which performer will be responsible. May carry out any or all of the following:

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a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray. May assist in preparation of syringes containing saline solution, local anesthetic, anticoagulant, contrast solution. Notes or checks amounts ordered.

b. If performer will be responsible for overhead films, prepares ahead for use of fluoroscopy with surgical procedure, use of overhead film to check needle placement, automatic or hand injection (especially if computer controlled), and serial filming:

   i) May reset technical factors for fluoroscopy and serial filming based on radiologist's review of scout film(s) and the presence of contrast for serial films.

   ii) If check of needle and/or catheter position will be needed during surgical procedure, performer prepares cassette(s) with ID information as appropriate. May plan to use Polaroid cassette and processing equipment.

   iii) If not already done and required for equipment to be used, performer reviews with radiologist orders for sequence and timing of serial filming. Notes whether subtraction films are to be made. If so, makes sure that program or settings allow for a plain film to be taken for each view, followed by injection and serial films; notes rate per second and intervals between sequences to allow for arterial, capillary and venous phases as required for cerebral angiography or venography.

   iv) Sets programs for serial cassette changer(s), automatic injector as appropriate. Checks that planned exposure time does not exceed available capacity of unit. If not already done and computer program will be used, checks keypunch control card and places in computer control panel.

   v) Performer may load cassette changer(s) with proper number of vacuum or other type of cassettes as ordered. (If appropriate, loads cut film changer or roll film changer.) If the same changer will be used for lateral and AP projections, loads only enough cassettes for series in the first (lateral) position to avoid artifact caused by shadow from last exposure in one position on the first cassette to be used in next position.
   If biplane changers are to be used, performer notes whether the exposures will be simultaneous or alternating; loads changers as appropriate.
   For computer controlled units, plugs synchronization cable from control unit into appropriate receptacle on the x-ray control panel.

   vi) May set up equipment for automatic marking of films in numerical sequence or records cassette numbers for the sequence.

   vii) If automatic pressure injection is to be used, may attach tubing to syringe(s) with contrast using sterile technique. Attaches to machine and mounts syringe(s) as appropriate. Checks that there are no air bubbles. If appropriate, makes sure machine is on "stand-by." Makes sure machine is grounded.

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viii) If automatic injection is not computer controlled, sets flow-rate dial for the cc's per second as ordered by radiologist. When ordered by radiologist, sets pressure control as designated.

c. If performer is to assist with preparation of patient for puncture, washes hands observing sterile technique when appropriate.

- i) If not already done, may arrange to have puncture site(s) shaved and prepared.
- ii) May have patient placed in or maintained in supine position on table with head resting on occipital area over AP cassette changer.
- iii) For access to carotid artery, internal jugular or frontal vein, may lower head end of table for Trendelenburg position; may extend patient's neck. May place supports under patient's shoulders or neck. Turns head away from first side to be punctured.
- iv) For antecubital arterial puncture may tape arm to pad or arm board in extended position.
- v) For femoral arterial puncture abducts patient's legs and exposes the femoral artery on the side to be punctured below the inguinal ligament as high as possible, but allowing for later compression proximal to puncture site.
- vi) Immobilizes head as appropriate. May place compression bands across patient's body; may use wrist restraints.
- vii) May swab puncture site area with antiseptic solution and cover surrounding area with sterile towels.
- viii) May make sure that ECG monitoring leads have been applied, or decides to do personally.

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d. If not already done, may provide radiologist with lead shielding, gloves, sterile gown, gloves, mask. Makes sure that patient and everyone to remain in room is properly shielded; may place lead screen in place if radiologist will inject contrast by hand.

e. If patient is to have general anesthesia, performer awaits signal that procedure can begin.

f. May receive or obtain a clean hospital gown, cotton "boots," cap and mask. Dons these before approaching sterile area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids touching patient, drapes, radiologist, nurse, or instrument table with nonsterile objects.

g. For internal jugular or frontal vein puncture performer may assist with application of sling tourniquet or may practice application of digital compression to the veins as ordered by radiologist. If performer is to apply compression personally, dons lead gloves and uses lead screen and apron.

h. During injection of local anesthetic, puncture, placement of needle or catheter, performer assists as appropriate:

- i) May hand materials and supplies asked for using sterile technique.
- ii) May assist with fluoroscopic viewing of needle and/or progress of catheter placement. On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders.

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iii) Performer may operate tilt table on orders from radiologist, or assist in positioning patient as ordered. May apply manual pressure as rehearsed.

iv) For overhead check of needle placement, performer places cassette as indicated by radiologist. Sets technical factors as appropriate for location as for plain films. Collimates to area of interest and makes exposure. Has film processed at once or decides to do personally. Places for radiologist to view.

v) Continues as ordered until radiologist is satisfied with needle or catheter placement.

vi) Repeats as appropriate for bilateral injection.

i. If radiologist decides on pressure for automatic injection during observation on TV monitor, performer sets pressure control as ordered, with machine on "stand-by."

j. Once catheter position(s) are judged satisfactory, may tape into position maintaining sterile field.

k. If amount of contrast to be used is decided during fluoroscopic observation, performer may have syringes filled as appropriate.

8. Performer coordinates serial filming with the radiologist when so ordered:

   a. Performer sets up for lateral filming as described, or for simultaneous or alternating biplane lateral and AP filming. Collimates to the area of interest. Notes side of interest.

   b. Reviews with radiologist proper timing in relation to injection sequence for lateral views unless this is all to be done automatically. Allows for plain films to be taken before injection if subtraction films are ordered.

   c. On signal from radiologist performer starts the automatic film changer, or initiates the computer control of the injection and serial exposures at the control panel.

   d. If at any time performer is to apply manual pressure while co-worker initiates exposures, performer carries out compression to jugular veins, anterior facial veins, or other veins as rehearsed or ordered at appropriate times.

   e. Performer has the serial films processed at once or decides to do personally.

      i) Makes sure that cassettes are numbered for appropriate order in sequence.

      ii) When the serial films have been processed, performer may place on view boxes with biplane AP and lateral views together and in appropriate serial order. Notifies radiologist that they are ready.

   f. Unless biplane seriography has been carried out, performer sets up as quickly as possible for AP filming and second injection. If appropriate for bilateral injection repeats for opposite side as appropriate:

      i) Reloads serial changer with cassettes or adjusts roll or cut film transport for AP serial projections. Removes radiolucent pad from under head.

      ii) Sets up for AP projection as described earlier.

      iii) Repeats coordination of injection and exposures, processing, and placement for review as described.

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g. After processing, if radiologist indicates that subtraction prints are to be made, performer notes which post-injection radiographs (for each view) the radiologist wishes to utilize. Places the plain (pre-injection) film with the counterpart post-injection views selected by radiologist.

   i) Makes out order for subtraction prints and takes to staff member who carries out this procedure. May present orders orally: may decide to prepare personally.
   ii) When subtraction prints are ready, performer places for viewing as described.
   iii) Repeats as appropriate if second order subtraction prints are ordered by radiologist.

9. If radiologist decides to repeat any exposures, performer resets technical exposure factors, pressure settings, etc., as required and repeats appropriate steps.

If radiologist decides to have additional views made, performer notes radiologist's orders and prepares as appropriate:

a. Notes orders for a change in amount of contrast, change in pressure settings for automatic injection, and/or the rate and speed for serial filming. Adjusts equipment as appropriate.
b. If radiologist orders additional views, performer makes any changes in x-ray tube position, angulation and/or position of cassette changer and/or position of patient's head as appropriate:

   i) For half-axial AP projections, performer maintains patient's head in AP position as described. May direct central ray to the region of the hairline at about 30° to 37° caudad or as ordered, depending on area of interest, with central ray exiting at the external auditory meatus. Keeps infraorbitomeatal line vertical.
   ii) For half-axial oblique projection, rotates head 35° to 45° away from the injected side and directs central ray to the region of the hairline, about 30° to 37° caudad or as ordered, depending on the area of interest.
   iii) For an oblique projection, rotates head about 30° away from the injected side or as ordered. May direct central ray to the midorbit of the uppermost side about 20° cephalad; may direct central ray 2 cm. cranial to, and parallel with, a line from the supraorbital margin to a point 2 cm. cranial to the external auditory meatus, depending on area of interest.
   iv) For a submentovertical projection of the cranial base (underside of chin to top of cranium), performer maintains patient in AP position on table extension and adjusts cassette changer to upright position. Elevates torso so that head can be extended, and rests head so that the vertex is against the upright film holder. Flexes patient's knees and supports. Supports head after adjusting central ray angulation and repositions only when ready to make exposure so as to keep strain on neck to a minimum.

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Adjusts head so that median sagittal plane is at right angles to film and so that the infraorbitomeatal line is closely parallel to the plane of the film. Adjusts the central ray so that it is at right angles to the infraorbitomeatal line, centered as ordered.
Centers film to central ray. Directs central ray to enter the median sagittal plane of the throat between the angles of the mandible and the sella turcica at appropriate anterior angle or as ordered. May immobilize head with tape placed on the chin and anchored to the sides of the head support.

c. If magnification is requested by radiologist for AP or lateral projection, performer may set up as follows before next injection and filming:

i) Removes grid from changer. Determines the degree of magnification requested. If the request is expressed as an area magnification, performer determines the linear magnification by taking the square root. (Linear magnification squared equals area magnification.)
ii) If the distance from the patient to the film, object-film distance (OFD) will be a relatively inflexible distance, performer measures this distance.
iii) If the distance from the focal spot (target) to the patient, target-object distance (TOD) will be the relatively inflexible distance, performer determines what this is by measuring or reading appropriate indicator scale on tube housing.

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iv) Defines the target-film distance (TFD) as the sum of OFD and TOD.
v) Depending on whether the OFD or the TOD is fixed, performer calculates the required complementary distance by referring to a magnification chart for the degree of linear magnification required, or uses the formula: degree of linear magnification equals TFD divided by TOD. For a two-times linear magnification performer simply sets the TOD equal to the OFD.
vi) Performer adjusts and locks the film or head support height and/or the tube height to the calculated OFD and TOD. Rechecks TOD and OFD to be sure that they correspond to the calculated distances.
vii) Performer adjusts the collimation to correspond to the field size anticipated (for the TOD involved).
viii) For magnification technique using a vertical cassette changer, adjusts upright holder to appropriate height; adjusts x-ray tube to right-angle horizontal projection of beam to film; centers to the film; measures and adjusts TOD to patient's position; measures and adjusts OFD from patient's position.
ix) If the sum of the new TOD and OFD (TFD) is now different from the TFD used for non-magnification technique, performer may consult technique chart to note the factor to use for a compensatory change in mAs. May also note the change in kVp and mAs necessary to compensate for any change in collimation from non-magnification technique. Con-

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sults appropriate chart for conversion factors. May record. Performer resets technical factors as appropriate.

d. If appropriate, repeats procedures as ordered for opposite side study.

e. For each new series, performer carries out positioning, setting up for amount, type of injection. Resets equipment for automatic pressure injection and serial filming as ordered, and applies manual compression if appropriate. Coordinates with radiologist and repeats appropriate steps including processing and placing for review. Continues as ordered.

f. Throughout procedure performer remains alert for any symptom of emergency or adverse reaction to contrast. As soon as performer judges that there is a reaction, performer notifies radiologist immediately.

10. When informed by the radiologist that the radiographic examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

a. May assist while radiologist removes connecting tubes, syringes, or needles.

b. May prepare to apply pressure to arterial puncture site when ordered. May prepare to apply pressure dressing to puncture site after manual pressure has been applied.

c. Performer coordinates with anesthesiologist if present and/or other staff members responsible for recovery and after-care of patient. Makes sure that patient is attended and will be transported to appro-

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priate next location such as recovery area or room.

d. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders additional examination or delayed abdominal film.

e. Performer records the examination according to institutional procedures. May include date, room, examination type, the serial overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.

f. Performer may record the fluoroscopic exposure including exposure time and rad dosage from posted data.

g. May have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements. Has reusable catheters flushed at once.

h. Performer may return accessories such as computer control cards and immobilization devices to appropriate locations or has this done.

i. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures.

j. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

TASK DESCRIPTION SHEET

Task Code No. 505

This is page 1 of 19 for this task.

1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;positioned in PEG chair;cassettes identified;technical factors selected and set;scouts taken;physician assisted with spinal puncture;radiographs,tomograms,stereofilms taken as ordered,processed,presented,repeated as ordered;examination recorded;radiographs placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, medical-technical history,prior films;view boxes; pen;x-ray generator(s),control panels,x-ray tubes, collimators,cassettes;extension cones;R-L,ID,level markers;pad;head support;immobilization devices;tape; scissors;shielding;calipers;protractors,triangles; manometer;adult or pediatric PEG chair;tomography attachment;stereography equipment;vertical grid cassette holders;sterile procedure tray for spinal puncture or trephining;iodized oil contrast;specimen test tube,label;gloves,masks,gowns;basin;drape; towels;emergency cart;wax pen,pacifier,toys;technique,standard view,tube rating,rad exposure charts; wheelchair;stretcher

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. **If "Yes" to q. 3:** Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.;radiologist;surgeon;nurse;anesthesiologist; co-worker

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking pneumoencephalograms or brain ventriculograms of any pt. by reviewing request,measuring,reassuring pt.;preparing pt. for procedure;making scout films; assisting with spinal puncture or surgical entry and injection of air or gas;setting up,immobilizing pt. for filming head in rotating PEG chair;identifying films;applying shielding;collimating;setting technical factors;setting up for stereography,tomography; making exposures in erect,brow-up and brow-down positions as ordered;having films processed,reviewed;repeating,adjusting;making positive contrast ventriculograms as ordered;assisting with termination;placing radiographs for use;recording examination.

List Elements Fully

Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a patient scheduled for cerebral pneumography radiographic study of cerebral cortex and ventricles after removal of some cerebrospinal fluid and replacement by air or gas,either by needle entry through subarachnoid spaces in spine (pneumoencephalography), or by direct entry into skull and ventricles by surgical trephining (ventriculography),as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s).

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for, whether pneumoencephalography or ventriculography.

      i) If pneumoencephalography, notes whether

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

TASK DESCRIPTION SHEET (continued)

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List Elements Fully

fractional filling will be employed.

- ii) If ventriculography, notes where the surgical procedure will be carried out, whether patient will arrive before or after introduction of air or gas contrast, whether positive contrast (iodized oil) may also be used.
- iii) Notes whether a PEG chair (somersault chair) will be used, whether tomography unit is available and/or ordered, whether stereo filming may be required.
- iv) Notes whether general anesthesia may be administered.

b. Notes name of radiologist (and surgeon for ventriculography) in charge, names of other staff members assigned, such as anesthesiologist, neurologist, any staff member who will monitor vital signs.

c. Performer reads patient's name, identification number, sex, age, and weight.

d. Depending on institutional procedures and type of examination, notes whether performer is to set up equipment and/or prepare patient personally, or whether performer will join patient, radiologist (and surgeon) and procedure team in appropriate procedure room.

e. Performer notes how patient will arrive for examination (whether already sedated in wheelchair, on stretcher, accompanied by whom, whether patient will be coherent).

- i) Notes any orders for prior preparation of patient such as administration of IV infusion, medication, sedation, reports on vital signs, shaving of entry site(s), withholding of morning meal, emptying of bowels and bladder prior to lumbar puncture, and proper timing.
- ii) Checks whether orders for prior preparation were carried out and at appropriate time. Reports any problems to radiologist or arranges to have procedures carried out and/or examination delayed.
- iii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus. Reports any problems to radiologist before continuing.
- iv) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention.
- v) If positive contrast may be ordered, notes whether there is allergy report. If patient has allergic history, plans to bring this to radiologist's attention.

f. Performer considers the x-ray and accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition and the examination ordered.

TASK DESCRIPTION SHEET (continued)

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List Elements Fully

i) Notes appropriate sterile procedures and supplies needed.

ii) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.

g. If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to select technique or to properly position or immobilize patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

h. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary. Washes hands as appropriate.

a. Checks that room is equipped with two x-ray units and two film holders to permit frontal and lateral projections without repositioning patient.

i) If appropriate, checks that proper size PEG chair (adult or pediatric) is present and, if motorized, checks that it is in proper working order.

ii) Notes whether tomography attachment (if any) is in place and functioning, whether equipment is set up for stereo filming (if ordered).

iii) If not already done, has equipment cleaned as appropriate for use in sterile procedure or decides to do personally.

iv) Makes sure that x-ray unit(s) are ready for use. Goes to control panel(s) for x-ray generator(s) and checks that indicator light shows that machines are "warmed up," or turns on main switch as appropriate to equipment and allows time for machines to "warm up." If appropriate, performer may set radiography or tomography mode selector and set collimator control for manual operation.

v) Performer reviews the technique chart for the machine(s) to be used and takes note of any newly posted changes in technical factors (to reflect accommodation for change in machine output or a policy decision).

b. Checks that procedure tray for the examination has been properly prepared or decides to do personally:

i) Checks that materials of various or appropriate sizes are present for lumbar puncture or trephining and injection of air or gas. May check for emesis basin and towels, sterile drapes, local anesthetic, antiseptic solutions.

TASK DESCRIPTION SHEET (continued)

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List Elements Fully

- ii) If positive contrast ventriculography may follow, checks that iodized oil contrast is available and, if not at required temperature, heating device.
- iii) May check that label and sterile container for cerebrospinal fluid specimen is prepared or decides to do personally. May check that manometer is present.

c. Checks that emergency cart is present and equipment to monitor vital signs if appropriate.

d. Checks that proper accessories are available for procedure including leaded rubber shielding, aprons, and gloves to be used by performer, radiologist, the patient, and/or anyone who will remain in the room during exposure.

- i) Checks for hospital gowns, masks, gloves to be worn for sterile procedure.
- ii) Checks that appropriate immobilization devices for adult or child are present.
- iii) Checks that extension cones are available.
- iv) Makes sure that right (R) and left (L) markers are available for use and identification cards or leaded markers or numerals for film identification (and recording of level and amplitude for tomography).
- v) Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. If not, arranges to obtain or decides to obtain personally.

e. Performer prepares for identification of the films using equipment provided by institution:

List Elements Fully

- i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.
- ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write out ID information on card if not received with requisition.
- iii) Checks identification against requisition sheet.

3. Depending on institutional procedures performer may bring requisition sheet, patient's chart, and prior films to radiologist; may bring or escort patient and accompanying staff to examination room; and/or may join radiologist (and surgeon), staff and patient after preparing for procedure.

a. If performer is to prepare patient in examination room, may proceed as follows:

- i) Washes hands as appropriate.
- ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room (wheeled on stretcher or wheelchair if patient has been sedated; escorted or carried if child or adult patient is to have general anesthesia after entering department).
- iii) Performer greets a coherent patient and any accompanying staff person and introduces

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self. Checks patient's identity against the requisition sheet, referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

iv) Performer has patient assisted to PEG chair or decides to do personally with help, depending on whether patient is to be put into position in chair before being examined by radiologist. Makes sure that no equipment is in the way that may be collided with by patient.

If patient is in wheelchair, moves patient in chair into position next to PEG chair. Locks wheelchair and obtains help in lifting patient from wheelchair to PEG chair.

If patient is on stretcher, places stretcher into position and locks so that patient can be lifted from wheeled base to PEG chair.

May have nurse carefully lift infant and then place in pediatric PEG chair, or lifts infant carefully, supporting infant's head, and places in position with head supported.

v) Makes sure patient is being attended and there is no danger patient will fall off chair.

vi) Has patient's dentures, hair pins, spectacles, and any jewelry at head and neck removed if not already done. Makes sure that all garments are removed down to below the neck. If not already done, has infant patient's clothing removed and has patient put in gown and kept as warm as appropriate.

List Elements Fully

Makes sure that any life support equipment is being monitored.

vii) Answers patient's questions honestly; attempts to reassure and develop confidence. Remains aware that patient may be frightened, may be disoriented due to effects of sedation.

Performer explains when asked medical questions that it is not appropriate for technologist to answer these; encourages adult to speak to physician.

Attempts to develop a warm interaction with infant or child. May speak to patient in calm, gentle voice; attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning and coherence.

viii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy; asks about prior preparations ordered for patient; and/or asks about allergies or adverse reaction to contrast.

ix) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

x) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the skull

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at the level and in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors. After measuring, has patient rest in as relaxed a position as possible.

b. Performer may inform radiologist that patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films to radiologist.

   i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.
   ii) Performer may accompany radiologist to examination room, make introductions or greet patient and/or staff.
   iii) May provide radiologist with gown, gloves, mask, lead apron and gloves.

c. If not already done, performer joins radiologist, surgeon, patient and other staff in examination room.

d. During radiologist's review of requisition, prior radiographic materials, and examination of patient, performer notes radiologist's orders:

   i) If radiologist decides to cancel or reschedule procedure,

List Elements Fully

performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.
   ii) If radiologist decides that additional preparatory steps are needed, performer may arrange to have these carried out and/or performer arranges to reschedule patient.
   iii) Performer notes radiologist's final decisions on how to proceed. Notes radiologist's orders for scout films, type of immobilization, preparation of patient, puncture site and materials.

4. Performer positions patient in PEG chair as appropriate to the model at the institution:

   a. Seats patient in chair in normal upright position. Places padding in position to protect patient from straps and buckles.
   b. Buckles patient into position so that torso, shoulders, arms, pelvis, thighs, legs, feet and wrists will be supported in any position from upright through brow-up and brow-down.

      i) Checks straps and buckles to make sure that they are supporting patient firmly but not cutting off circulation.
      ii) With pediatric patient, may also use towels, gauze bands and tape to immobilize in pediatric chair.

5. Performer makes scout films as ordered after making sure that patient is being attended. Sets up equipment for the examination before positioning and immobilizing patient:

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a. Performer selects the speed, type of film, grid, and cassette combinations appropriate for the projection and equipment to be used as determined by institutional standards. Selects size based on the size of the patient's skull.

b. Performer identifies cassettes for frontal and lateral projections:

   i) Places right or left marker on cassette holder or cassette as appropriate to the equipment, or depresses appropriate R or L button for automatic marking.

   ii) If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.

   iii) If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette. Performer may place patient's card into card tray for equipment using automatic film marking device.

   iv) Performer places one cassette in each of two upright cassette holders placed for frontal and lateral projections.

c. Performer selects the exposure factors for the first and second projections. May consult the technique chart posted for the machine. For each projection proceeds as follows:

   i) Locates the information needed for the skull projections involved according to the thickness of the part and the collimated field size to be used.

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Makes sure that technique relates to the combination of film type and speed, focal spot size, FFD and use or nonuse of other accessories (such as screens, grid, etc.).

   ii) Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (FFD) called for.

   iii) Once the standard kVp, mA and time have been determined, performer notes whether any conversions are necessary to account for patient's age, condition, preference of the radiologist involved, and any other conversion needed such as posted change. Performer looks up numerical conversion factors and calculates, or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.

   iv) Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

d. Performer sets exposure factors as selected:

   i) At control panels makes sure that indicator light shows that

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x-ray generator(s) are ready for use. Makes sure that all circuits have been stabilized. Checks that controls are set for radiography mode.

ii) As appropriate, checks line voltage meters and, if needed, turns compensator dial until needle is aligned properly on line meter.

iii) For each projection selects milliamperage and chooses selectors for the correct focal spot size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

iv) Depending on the equipment, may set controls to provide for use of manual adjustment of tube height, position, and collimator (unless these have already been set).

v) Performer sets each unit's focal-film distance (if not already done). Operates controls or manually moves each x-ray tube into place at right angles to upright holders. Checks the focal-film distances by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

e. Performer prepares the patient in the position selected for the scout exposure:

i) May explain or demonstrate to patient what is required. May obtain help in positioning.

ii) May tape the auricles of each ear forward with a narrow strip of adhesive tape. Makes sure

List Elements Fully

that tape does not extend beyond the posterior junction of the auricle and the head.

f. In positioning head, performer refers to standard reference lines. May use wax marker to draw in reference lines or points on skull or visualizes mentally. In positioning head, has patient first relax muscles of neck and then moves head gently.

i) Performer defines the median sagittal plane of the skull by referring to the sagittal line connecting the nasion, acanthion and symphysis menti (mental point).

ii) Performer marks or defines the orbitomeatal line for reference as that connecting the external auditory meatus and the outer canthus of the patient's eye.

iii) Performer marks or defines the infraorbitomeatal line (Reid's base line) as that connecting the external auditory meatus and the infraorbital margin. May palpate to find infraorbital point.

iv) Performer marks or defines the supraorbitomeatal line as that connecting the external auditory meatus and the supraorbital margin. May palpate to find supraorbital point.

v) Performer marks or defines the acanthiomeatal line as that connecting the external auditory meatus and the acanthion.

vi) Performer defines the interpupillary line as the transverse line which connects the pupils of the eyes when the patient is looking straight

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ahead, with the nasion at its midpoint.

g. Performer centers skull and keeps the long axis parallel to the film holder. With upright holder, adjusts height of holder to part and centers part to film.

h. In setting the tube angulation, the performer measures the angles between the central ray and the reference lines on the patient's skull, such as the orbitomeatal line.

  i) Checks skull rotation by measuring the angle between the horizontal plane or the vertical central ray and the median sagittal plane of head.

  ii) If head cannot be adjusted so that the reference line on head is at the specified angle to the film, performer measures the angle between the desired one for the reference line and the actual angulation obtained. Adds the measured difference to the prescribed central ray angulation to compensate and thus obtain the required projection.

i. If erect lateral and/or PA projection(s) of the area of the fourth ventricle, aqueduct of Sylvius, cisterna magna and the vallecula of the cerebellum are required, performer positions the patient's head and maintains the position for both projections. Adjusts the laterally placed upright grid cassette holder and the horizontal x-ray tube for the lateral projection. Makes the exposure, and then places a cassette in the upright cassette holder in front of head, and positions x-ray tube from behind patient's head.

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i) Performer has patient rest head on chin support with neck somewhat flexed and with the frontal area resting against the vertically placed grid cassette holder, centered to the frontal area. Places the lateral grid cassette holder vertically on side of interest against patient's cheek, centered to the mastoid process.

ii) Adjusts head so that the median sagittal plane of the head is exactly perpendicular to the frontal cassette holder and exactly parallel with the plane of the laterally placed film. Adjusts flexion of head so that the orbitomeatal line is at an angle of 25° with the horizontal plane, open forward, or as ordered.

iii) Places cassette in lateral holder if lateral film will be exposed first; places cassette in frontal cassette holder if the PA film will be exposed first.

iv) For a lateral projection of the foramen magnum area, directs the central ray at right angles to film, directed to the region of the mastoid process.

v) For a lateral projection of the fourth ventricle, directs the central ray at right angles to film through a point just above the auricle.

vi) For a PA projection (anterior view) of the fourth ventricle and vallecula, directs central ray at right angles to the film entering the midline at the level of a point just above the auricles.

vii) For a supraorbital PA projection of the fourth ventricle

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List Elements Fully

directs the central ray caudally, entering the midline just above the level of the auricles on a line parallel with the supraorbitomeatal line.

j. If autotomography has been requested for any lateral projection (when tomography equipment is not available or not feasible with equipment to be used), performer rehearses a patient who can cooperate. Has patient practice rocking the head from side to side in an arc of about 10°, as if saying "no," with forehead remaining in contact with the grid front of the cassette holder.

k. Performer may have patient practice breathing out and holding breath when ordered until told to relax, or observes patient's respiration and plans to make exposure at the rest phase of exhalation.

l. Performer immobilizes patient's head. May place restraining bands as appropriate using strips of gauze and adhesive tape. After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration, and other vital functions.

m. Performer checks final positioning using triangles, protractor and light in collimator. Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the part to the film holder and to center the tube to the part. Rechecks angulation of head and central ray. Checks that the primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust x-ray tube position to provide better centering.

n. Performer provides for appropriate collimation and shielding:

  i) Once the patient has been positioned and immobilized, performer adjusts the collimator. Collimates so as to expose only the area of interest (and thus provide maximum protection and detail). May use extension cone (in direct contact with head when appropriate for immobilization) for proper collimation. Adjusts primary beam to minimum size needed to cover the area of interest.

  ii) If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.

  iii) Supplies anyone holding the patient (if absolutely necessary) or remaining in room with lead gloves and apron and makes sure he or she stays out of central beam. Explains if necessary that this is not cause for alarm but a general precaution to avoid unnecessary radiation exposure.

  iv) May mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

o. Performer makes first (or next) exposure:

  i) Observes the patient's movement until the moment that the ex-

TASK DESCRIPTION SHEET (continued)

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posure is made. Readjusts position if warranted.

- ii) Returns to control panel. Makes sure controls are properly set and patient is still in position.
- iii) As rehearsed, tells patient when to breathe out and hold, and/or when to start rocking for autotomography, or observes patient's breathing and times exposure for the rest phase of exhalation.
- iv) Performer initiates exposure by pressing hand trigger or exposure control button.
- v) While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.
- vi) May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
- vii) After exposure is completed, tells patient and any adult with infant that he or she can relax.
- viii) After exposure performer returns to patient. Removes cassette from holder. Removes any markers for further use.

p. Performer repeats radiography steps for all scout exposures ordered before review by radiologist, adjusting technical factors, and x-ray tube as appropriate to each projection ordered.

q. Performer arranges to have the scout exposure(s) processed at once or decides to do personally.

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Attaches ID card for use with flasher if appropriate. May sign requisition. While films are being processed, makes sure that patient is comfortable and attended by staff person or self.

r. Performer brings the processed scout film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom. May display prior films as well. Informs radiologist when the scout films are ready.

- i) During radiologist's review of scouts performer notes whether radiologist requires a change in technical factors and/or patient positioning or centering for later filming.
- ii) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography if so ordered.
- iii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."
- iv) Notes radiologist's final orders on sequence of examination and use of contrast and equipment.
- v) As required, resets technical exposure factors as appropriate for first set of postinjection overheads using air or gas and reflecting radiologist's orders.

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6. Performer carries out preparations for pneumoencephalography or ventriculography as ordered by radiologist (or surgeon) based on the part of the work for which performer will be responsible. May carry out any or all of the following:

   a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered and not already on tray. May assist in preparation of puncture needles, syringes, local anesthetic, iodized oil contrast (if it may be used) in amounts ordered. Checks contrast for signs of chemical deterioration.
   b. Prepares ahead for overhead filming and processing:

      i) Identifies cassettes as described.
      ii) May review sequence of filming if fractional introduction of contrast will be used.
      iii) If not already done, performer may provide radiologist with lead shielding, gloves, sterile gown, gloves, mask. Makes sure that patient and everyone to remain in room is properly shielded.

   c. If performer is to assist with spinal puncture or trephining, may carry out any or all of the following steps:

      i) Performer checks position of patient in PEG chair or positions as described above.
      ii) For spinal puncture places patient in seated erect position with chin supported and neck flexed so that upper forehead is leaning slightly forward against the vertical grid. Immobilizes head. Makes sure that the area of the puncture site (lower lumbar or cervical region) is accessible through the open back of the chair.
      iii) For surgical entry for ventriculography (if not already done), performer adjusts patient's head in PEG chair as ordered by surgeon to provide access to the posterior half of the head.
      iv) May have entry site prepared or carries out personally using sterile technique: Washes hands as appropriate. Swabs area with antiseptic solution. Allows to dry; may then repeat with alcohol.
      Covers surrounding areas with sterile towels or drape.
      v) If patient is to have general anesthesia, performer awaits signal that procedure can begin.
      vi) Performer may receive or obtain clean hospital gown, cotton "boots," cap and mask. Dons these at appropriate time before working in sterile area. Carries out appropriate steps to maintain the integrity of sterile areas; avoids touching patient, drapes, radiologist, nurses, or instrument table with nonsterile objects.

   d. Informs radiologist and/or anesthesiologist or surgeon when patient and materials are ready.

7. During spinal puncture or surgical ventricular entry performer may assist using sterile technique:

   a. May hand materials and supplies when asked. May provide manometer (with spinal tap) when asked. May

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record cerebrospinal fluid pressure as dictated by radiologist.

b. As radiologist removes cerebrospinal fluid performer may hold prepared test tube or container while radiologist ejects contents in syringe into it; or receives test tube. May arrange to have specimen covered and prepared for laboratory or decides to do personally.

c. May assist with sterile dressing of puncture or trephine sites unless needle is kept in place for fractional filling.

8. On orders from radiologist performer takes the first set of erect radiographs, as described above for the scout films or as described below, depending on orders.

   a. For each set of radiographs performer repeats appropriate steps, makes exposures and presents to radiologist for review as described, and awaits further orders.

      i) When making exposure with patient under general anesthesia performer may await signal from anesthesiologist that respiration has been suspended; makes exposure and indicates to anesthesiologist when respiration can be resumed.

      ii) For each set of fractional films positions patient's head before the injection by radiologist or surgeon and makes exposures as quickly as possible after injection of contrast.

      iii) With fractional filling technique performer makes sure not to dislodge puncture needle. Between series assists with removal of additional fluid and

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additional injections of air or gas as appropriate.

   b. If an erect oblique lateral projection is ordered, performer maintains patient's head in the initial flexion as described and turns the occiput away from a laterally placed film 7° to 10° as ordered. Directs central ray to the area of interest at right angles to the plane of the film.

   c. If erect projections of the basal cisterns are required, performer positions patient's head as described earlier.

      i) For a PA projection of the basal cisterns, performer directs the central ray to the midline at a level just above the auricles at 5° cephalad or as ordered. May then make projection with central ray at 15° cephalad or as ordered.

      ii) For a lateral projection of the basal cisterns performer positions head in more erect position so that the orbitomeatal line is horizontal, and the median sagittal plane is parallel with the plane of a laterally placed film. Directs central ray at right angles to film through the sella turcica (a point about 3/4 inch anterior to and 3/4 inch above the external auditory meatus).

      iii) If erect projections of the third and lateral ventricles are required, performer positions as in (ii), above, but directs the central ray just above the auricles.

9. When all the erect projections have been made and reviewed, performer

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may receive orders for stereo filming and/or tomography. Performer notes the positions and projections ordered. Positions patient's head and cassette (s) as described above according to projections ordered. May proceed as follows depending on the equipment available.

10. For stereo-filming, unless equipment is automatic, performer proceeds by centering and directing the central ray for stereographic examination. Performer centers and adjusts the central ray at the angle for a single plane study as follows:

    a. For first exposure moves centering point the correct distance in the appropriate direction (such as lateralward or posterior); then increases or decreases the angle as appropriate.
    b. For the second exposure, removes the first cassette and replaces with a second cassette and, starting from single plane angulation, shifts centering in the opposite direction and for the same distance; changes the angulation in the opposite direction (increases or decreases).
    c. For automatic stereo-filming sets the two x-ray tubes into position for frontal or lateral shift at desired angle; places cassettes into position; and sets controls for automatic exposures in sequence.

11. For linear tomography performer notes the number of initial tomograms, the size of the "slice" (exposure angle or amplitude), speed and the initial level of interest ordered.

    a. Performer prepares marker giving the level at which the fulcrum will be set for the given exposure and attaches to cassette as appropriate.
    b. Performer sets the fulcrum (layer height) level for the first (or next) exposure:

        i) If a "book" cassette is to be used, performer sets the fulcrum level to coincide with the uppermost body layer to be projected.
        ii) If an automatic layer height selector is available, performer sets the controls to the interval distances selected, and sets the fulcrum for the uppermost or lowermost body layer desired depending on the direction of the automatic change.
        iii) Sets the fulcrum level using hand crank or power switch and checks the setting on the fulcrum (layer height) indicator.

    c. Performer sets the amplitude (sweep):

        i) Makes sure that x-ray tube is centered at zero angle. Checks focal-film distance.
        ii) Sets the prescribed exposure angle or amplitude as appropriate to equipment and checks angle on indicator.

    d. Performer sets the sweep speed as prescribed, according to the speeds available for the equipment, the exposure angle selected, and established procedure for the area of interest (or patient's age). Notes the duration or actual exposure time as the product of the angle and the sweep speed selected.

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e. Sets the directional control switch to right or left for horizontal travel or up or down for vertical travel depending on the direction in which the tube will travel during the actual exposure.

f. Sets exposure factors as appropriate.

g. Checks that no obstructions are present which might restrict tubemount travel.

h. Collimates and cones down as appropriate,and provides shielding as described. Provides shielding to eyes and/or small shielding over corneas.

i. Performer may test the tomographic set-up by proceeding with tubemount sweep but not activating exposure. Has patient practice breathing and holding still as ordered and permits patient to sense the duration time for each sweep:

  i) Turns on power for tomographic attachment or mode. Using appropriate switch, activates tomographic sweep action without activating exposure, and holds until tubemount reaches the extreme limit of travel.
  ii) Returns tubemount to other extreme position, holding until tubemount travel is complete. Interrupts travel at any point and makes any adjustments necessary. Returns equipment to "start" position.
  iii) Makes exposure as appropriate.

j. After exposure performer returns to patient. Removes cassette.

  i) Removes any markers.
  ii) Performer places ID, R-L and appropriate next layer height markers on cassette for next tomogram (unless book cassette was used).
  iii) Inserts new cassette as described.
  iv) Changes fulcrum to new layer height (level) as appropriate, unless this will be done automatically.
  v) Performer continues until all tomograms exposures ordered have been made.
  vi) Has tomograms processed and placed for review as described.

k. Performer notes instructions from radiologist regarding additional layer levels, amplitude, and number of cuts to be made for each position. Notes radiologist' preference for technical factors.

  i) Depending on radiologist's orders, performer makes tomographic exposures at the selected interval cuts (amplitude) and levels required for each position ordered, as described above.
  ii) Readjusts fulcrum level, technical factors, patient positioning, collimation and shielding as appropriate. Makes sure ID, R-L and layer heights are marked. Makes exposures and has tomograms processed at once as above.
  iii) Brings tomograms to radiologist and displays on view boxes as before.
  iv) Performer notes whether a given level will be further defined by smaller "slices" (expanded amplitude) within a more restricted area. If so, repeats procedures after adjusting amplitude and redetermining exposure techniques.

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v) Performer shows subsequent sets of tomograms to radiologist as processed, and proceeds as described.

12. Throughout procedure performer remains alert to patient's condition.

    a. Notes any signs of paleness, weak pulse, faintness, nausea.
    b. Notifies nurse or physician at once if patient shows emergency signs.
    c. May assist physician in rotating chair backward to help a patient that faints.
    d. May assist to prevent patient from aspirating vomitus.
    e. Reassures patient. May provide damp cold towel, emesis basin. May clean patient.

13. If performer is to take projections with patient in "brow up" or "brow down" or lateral recumbent positions, performer may proceed as follows:

    a. Performer may assist with removal of needle and dressing of site.
    b. Before rotating patient to brow up or down positions and/or "somersaulting" patient in chair, performer rechecks buckles and straps to be sure patient is being held securely. Operates motor to control movement of chair.
    c. At any point in procedure performer may, on orders from radiologist, maneuver patient in chair through a complete forward or backward "somersault" to circulate gas or air.
    d. If "brow-up" projections of the frontal and temporal horns of the lateral ventricle and anterior portion of the third ventricle are required, performer moves chair backwards so that patient's head is in supine position.

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i) Rests patient's head on a radiolucent support and adjusts grid-cassette holder vertically for lateral projections;adjusts cassette under head in horizontal position for AP projections.

ii) Positions head so that the orbitomeatal line is at right angles to the horizontal plane (for AP projection) and so that median sagittal plane is vertical and parallel with the laterally placed plane of the film (for lateral view). Immobilizes head.

iii) For an AP projection (posterior view) of the temporal horns, performer centers to the mid-orbits. Directs central ray at 10° cephalad to the midpoint or as ordered.
May direct central ray at right angles to a point halfway between the supraorbital ridge and the hairline.

iv) For a half-axial AP projection, performer directs the central ray to the hairline at a 25° to 35° caudal angle or as ordered.

v) For a lateral projection centers to a point just cranial to the auricle and directs the central ray horizontally to the midpoint.

vi) If autotomography is ordered for lateral view of the third ventricle, performer centers to a point one inch anterior to and one inch cranial to the external auditory meatus; and directs central ray at right angles to that point.

vii) For a lateral projection of the anteroinferior portion of the third ventricle, performer places a pad on the head support and lowers it to receive the head after it is fully ex-

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tended from the supine position. Rests patient's head on vertex. Places vertical grid-cassette holder in lateral position. Adjusts head so that the orbitomeatal line is as nearly horizontal as possible, and the median sagittal plane is vertical and parallel with the plane of the film. Centers to the sella turcica (3/4 inch anterior and 3/4 inch cranial to external auditory meatus). Directs central ray horizontally to the midpoint of film. Performer may use this positioning for autotomography.

e. If lateral recumbent projections of the lateral ventricles are required, performer rotates chair so that patient is in semiprone position and cheek is resting on a support on the horizontal plane.

i) Plans to radiograph both sides, rotating patient from one side to the other.
ii) Places grid-front cassette under cheek for each projection.
iii) Centers head so that the external auditory meatuses are superimposed at the midline of the cassette at the level of a point 1.5 inches cranial to the external auditory meatus.
iv) Adjusts so that the infraorbitomeatal line is parallel with the transverse axis of the film and the median sagittal plane is exactly horizontal. Supports the jaw to prevent rotation and immobilizes head.
v) Directs central ray vertically to enter at the midpoint described above, at right angles to the film.

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f. If "brow down" projections of the occipital horns of the lateral ventricles, posterior portion of third ventricle, and the fourth ventricle are required, performer moves chair so that patient's head is in prone position.

i) Rests patient's head on a radiolucent support with nose and forehead in contact with surface. Adjusts grid-cassette holder vertically for lateral projections and cassette under head in horizontal position for PA projections.
ii) Positions head so that the orbitomeatal line and the median sagittal plane are vertical, with median sagittal plane parallel with the laterally placed plane of the film. Immobilizes head.
iii) For a PA projection (anterior view), performer centers cassette to the midline of head, at the level of a point 2 inches cranial to the external auditory meatus. Directs the central ray at right angles to the midpoint.
iv) For a reverse PA half axial projection, performer directs the central ray 25° to 30° cephalad (cranially) or as ordered, entering the external occipital protuberance.
v) For a lateral projection centers cassette to a point just cranial to the auricle and directs central ray horizontally to the midpoint of the film.
vi) For a horizontal lateral projection ("hanging head" view) of the fourth ventricle, performer places a pad on the head support and lowers it to re-

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ceive the head after it is fully flexed from the prone position (i.e., is hanging down).
Rests head on vertex. Places vertical grid cassette holder in lateral position.
Adjusts head so that the orbitomeatal line is as nearly horizontal as possible and the median sagittal plane is vertical and parallel with the plane of the film.
Centers cassette to a point just cranial to the auricle. Directs the central ray horizontally to the midpoint of the film.

14. Performer follows radiologist's orders for each set of exposures.

    a. Makes stereoscopic and/or tomographic projections using the positions ordered as described.
    b. May take final projections in the initial "sitting" position(s) as ordered.
    c. Repeats any projections,making any appropriate adjustments as ordered.

15. If the radiologist and surgeon decide on positive contrast ventriculography, performer assists as appropriate:

    a. May prepare iodized oil in syringe and/or heats to room temperature or has this done.
    b. Performer may assist while the contrast medium is injected.
    c. Takes radiographs in the positions and projections ordered as described above.

        i) May assist while surgeon positions patient.
        ii) Resets technical factors as appropriate to take account of positive contrast medium.

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    d. May assist if so ordered with lumbar puncture to remove oil contrast. Assists as described earlier.

16. When informed by radiologist (and surgeon) that radiography is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

    a. Performer coordinates with anesthesiologist (if present) and/or other staff members responsible for recovery and aftercare of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area room or surgery.
    b. May present requisition form to radiologist for comments and signature.
    c. Performer records the examination according to institutional procedures. May include date, room, examination type, the views taken, the technical factors used, and film sizes. May record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.
    d. May check that cerebrospinal fluid sample has been prepared for laboratory, is properly identified, or decides to do personally. May present lab. order form to radiologist for signature.
    e. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements.

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f. Performer may return or replace special equipment to appropriate stored positions or locations. g. Performer may decide to jacket radiographs, requisition sheets, and related materials, and/or have information recorded in log book personally, or has this done, depending on institutional procedures. h. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt.reassured,measured,positioned;films identified;equipment set up for fluoroscopy,spotfilming,overheads;scouts taken;radiologist assisted with puncture,instillation,fluoroscopy, spotfilming;overheads taken as ordered;radiographs processed,presented,repeated as ordered;radiologist assisted with removal of contrast;examination recorded;radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Patient's x-ray requisition sheet,ID card,bracelet, medical-technical history,prior films;view boxes; pen;x-ray generator,control panels,tilt-table,x-ray tube(s);fluoroscopy unit,image intensifier;grid; bucky,spotfilm device;roll film or cassettes;TV monitor;collimator;R-L,ID markers;sterile procedure tray for spinal puncture; emergency cart;leaded shielding,aprons,gloves;immobilization devices;technique,standard view,tube rating and rad exposure charts;phantom or test object;calipers;protractor; vertical cassette holder;iodized oil contrast,heater; specimen test tube,label;gloves,masks,gowns;basin, towels;wax pen;wheelchair;stretcher;cassettes;extension cones;tubing;tape,gauze band;scissors;padding; shoulder and head supports,harness;footboard;manometer;stop lock

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.;radiologist;nurse;anesthesiologist;co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking positive contrast spinal or posterior fossa myelograms of any pt. by reviewing request; measuring,reassuring pt.;making scout films;preparing pt. for puncture;setting up for fluoroscopy,spot filming;assisting with puncture,fluoroscopy,spot filming;identifying films;collimating;applying shielding;setting technical factors;making overheads as ordered;having radiographs processed,reviewed;repeating,continuing as ordered;assisting with removal of contrast;terminating;placing radiographs for use; recording examination.

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Performer receives or obtains the x-ray requisition form, patient identification card, and any appropriate medical-technical history for a patient scheduled for positive contrast myelography (radiographic study of the subarachnoid spaces of the spinal canal and/or structures around the foramen magnum and posterior fossa after instillation of an iodized oil contrast medium) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements,performer may also receive prior plain film(s) or films of prior contrast studies.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:
   a. Performer checks the examination called for and purpose:
      i) Notes area of interest, such as posterior fossa, cervical, thoracic, or lumbar spine.
      ii) Notes site of puncture such as cisterna magna or lumbar spine.

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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  iii) Notes whether general anesthesia may be administered.

b. Notes name of radiologist in charge, names of other staff members to assist, examination room, time scheduled.
c. Performer reads patient's name, identification number, sex, age, weight, and height.
d. Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as patient arriving in traction, presence of respiratory or heart disease, communicable or infectious condition, presence of IV drip, behavioral disorder, incoherence. Notes whether patient will be arriving on stretcher, wheelchair, traction frame, will be accompanied by nurse, other staff.

  i) Notes whether patient has prior history of allergic reaction to contrast or history of allergies.
  ii) Notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.
  iii) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention.

e. Performer notes any orders for prior preparation of patient such as clearing of colon prior to lumbar

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myelography, shaving of area if cisternal puncture will be done, prior medication or sedation of patient. Checks whether orders have been carried out and whether administration of medication was at appropriate time to allow for medication to take effect.
f. If patient has history of allergies, if female patient may be pregnant,or if prior preparations have not be carried out,or if proper amount of time has not elapsed to allow medication to take effect, performer plans to report problem to radiologist or appropriate staff member, and/or arranges to have examination postponed as appropriate.
g. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment and the examination ordered.

  i) Notes appropriate sterile procedures required, appropriate shielding for the examination Notes whether film processing equipment is available adjacent to procedure room.
  ii) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.

h. If referring physician has requested that prior films,scans and test results already on file be sent with current radiographs, and if not already with patient's jacketed material,performer arranges to have these delivered.
i. If the performer determines that the request is not properly authorized, is incomplete,or that sufficient information is lacking for

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performer to select technique or to properly position or immobilize patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer plans to notify supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature,or orders.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary.

    a. Washes hands as appropriate. If not already done, has equipment cleaned for use in sterile procedure,or decides to do personally.

    b. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator (s) and checks that each indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for machine to "warm up."

        i) Makes sure that all circuits have been stabilized. If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

        ii) As appropriate, performer sets x-ray generator mode selector(s) to fluoroscopic mode, and/or for overhead filming as appropriate.

    c. Performer makes sure that an adequate supply of loaded cassettes for overhead and spot filming of the appropriate types and sizes are available in the examination room.

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        i) Checks that these are loaded with appropriate type and speed of film,with proper grid combinations,depending on the projections and techniques to be used, type of equipment, and institutional practices.

        ii) Selects size(s) based on the area(s) to be included, the views anticipated and patient's size.

        iii) If adequate supply is not in room, arranges to obtain or decides to obtain personally.

    d. Performer prepares for identification of overhead and spotfilm cassettes using equipment provided by institution:

        i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.

        ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface;may write out ID information on card if not received with requisition.

        iii) Checks identification against requisition sheet.

        iv) May place identification card into card tray for equipment using automatic film marking device.

        v) Makes sure that right (R) and left (L) markers are available for use and identification cards, leaded numerals or markers.

    e. If examination may include spot filming using a cassette/bucky spot film device, performer may insert cassette after properly identifying:

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i) May use controls or manually pull out spotfilm bucky tray and open retaining clamps.
ii) Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed.
iii) Moves cassette into appropriate "stored" position.
iv) If R-L markers are to be used with spot filming, performer tapes into place on image intensifier screen or plans to tape to patient's body.

f. If examination may include spot filming using a camera (attached to image intensifier) and roll film, performer checks film supply indicator to make sure that there is sufficient film in the roll film cassette.

i) If there is insufficient roll film in camera, performer arranges to have roll film cassette loaded, or decides to do personally.
ii) When loaded roll film cassette is obtained, performer checks loading in subdued light. Checks that end of film is cut correctly and is properly threaded and attached to take-up spool so that film unwinds appropriately. Checks that film is properly engaged in sprockets. Locks into operating position. If appropriate, cuts off excess film at exit port and removes. Attaches film cassette to camera and locks into place. Replaces camera cover.
iii) If there is an adequate film supply, checks that film is properly loaded.
iv) Performer advances film to compensate for any exposure of film due to installation or check.
v) Removes dark slide from camera lens.
vi) If not already done, performer writes or types a card with patient's identification information for use with spotfilm device. Inserts in slot in spotfilm camera as appropriate.

g. Performer reviews technical exposure factors for fluoroscopy,spot filming and overheads based on standards set by the institution as appropriate for the examination involved:

i) Locates information for the views and body parts likely to be involved. Takes note of the exposure factors to be used for overheads and fluoroscopy. Considers preferences of the radiologist involved, conversions needed to account for patient's age, condition, use of contrast. Notes any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).
ii) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.
iii) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

h. Sets up fluoroscopy equipment:

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i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.

ii) If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

iii) If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

iv) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness,performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position.

v) If a grid will be used with the image intensifier for fluoroscopy,performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

vi) May adjust distance between focal spot and image intensifier (focal spot to film distance, FFD). May check that TOD is 15 inches or more.

vii) Performer may collimate fluoroscopy tube (and x-ray tube used for spot filming if different) depending on nature of the equipment and controls.

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May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination,or may set shutter mode selector to automatic collimation.

i. If not already done, checks fluoroscopy mode. Operates controls in examination room behind leaded screen:

i) Makes sure that no one is in room.

ii) Places phantom or appropriate test object on radiography table where patient's area of interest will be centered for examination.

iii) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.

iv) If not already done, moves image intensifier into position; centers (over or under) the area of interest.

v) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.

vi) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.

vii) Checks mA meter and notes whether appropriate reading is obtained.

viii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.

ix) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when max-

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imum examination exposure time is reached.

j. Sets up for spot filming:

i) Sets control on image intensifier for spotfilm camera or cassette device.
For spotfilm camera, performer selects and sets the rate (frames per second) for the camera according to standards set for examination.
For cassette spot filming, performer may select and set a standard spotfilm program providing for format combinations such as single, half, or quarter combinations on a single cassette and related spotfilm sizes. Selects program appropriate for examination or awaits orders.

ii) Selects and sets exposure factors for spot filming.
For conventional manual exposure control, performer selects and sets the appropriate spotfilm time for the examination.
For automatic, phototimed exposure control, performer selects a density exposure control appropriate for the examination.
Selects the appropriate mA for the examination and the focal spot size to be used.
Selects and sets kVp by combining settings on one major and one minor kVp selector as appropriate for the examination.

iii) Manually sets collimator for the spotfilm size to be used, or selects and sets field size control to be used for automatic collimation with programmed spotfilm cassette exposure sequence.

iv) To check spotfilm functioning, performer may move cassette or roll film into x-ray exposure

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field using appropriate controls. Activates controls for spotfilm exposure. Notes whether cassette or roll film transport is operating appropriately.
Notes whether exposure is terminated by phototimer or, if manual timer, in time set. If appropriate, releases spotfilm control after exposure.

v) If equipment is operating appropriately, performer unloads cassette and reloads or advances roll film as appropriate. Moves bucky out of way until fluoroscopy is completed.

k. After equipment has been checked performer shuts and resets for selected exposure factors. If performer decides that any of the fluoroscopic equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

l. Checks that special equipment needed is present and sets up if not already done:

i) Makes sure that tilt-table is available. Sets up footboard and attaches harness or shoulder padding supports as appropriate for patient's age and size.

ii) Attaches myelogram stop lock to fluoroscope assembly if not already done.

iii) Checks that extension cones and vertical cassette holder are available.

m. Checks that proper accessories are available for procedure:

i) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure, and that appropriate

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shielding is available for placement between radiologist's hands and the patient.

ii) Checks that appropriate immobilization devices for patient's age and area of interest are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient. May arrange to have infant kept warm during procedure.

iii) Checks that emergency cart is available.

iv) Checks for hospital gowns, masks, gloves to be worn for sterile procedure.

n. Checks that procedure tray for the examination has been properly prepared or decides to do personally:

i) Checks that sterile spinal puncture materials of appropriate sizes for patient's age and puncture site are present.

ii) May check for sterile plastic extension tubing, emesis basin, towels, sterile drape, local anesthetic, antiseptic solutions.

iii) Checks that appropriate iodized oil contrast solution is present, that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool.

iv) May check that label and sterile container for spinal fluid specimen is prepared or decides to do personally. May check that manometer is present.

3. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, and prior films and scans to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or

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may join radiologist and patient after informing radiologist that equipment is ready:

a. If performer is to prepare patient in procedure room, may proceed as follows:

i) Performer washes hands as appropriate. Depending on patient's condition or age, may carry out isolation or decontamination techniques. May don gown, mask, gloves.

ii) Performer has the patient brought from holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room. If patient is in traction, makes sure that only trained staff move patient.

iii) Performer greets patient and any accompanying staff person and introduces self. Checks patient's identity against requisition sheet, referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

iv) Makes patient comfortable on table or has patient in traction placed as appropriate. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.
If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in

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locked position.

Performer may decide to assist patient to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.

If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.

May have nurse carefully place infant in supine position on table, or lifts infant carefully, supporting infant's head, and places on table.

v) Makes sure patient is being attended and there is no danger patient will fall off table.

If patient has traction, respiration, cardiac or infusion equipment attached, makes sure that equipment is being monitored.

vi) If not already done, has patient's dentures, hair pins, spectacles, and any jewelry removed. Makes sure that all garments are removed and that patient is in gown with opening in the back. Has infant kept warm as appropriate.

vii) If not already done, questions patient or accompanying adult about prior preparations and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

viii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

ix) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any pos-

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sibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

x) Performer may describe the procedure to the patient. May describe how the tilt table will be used, how head will be maintained in an extended position,and how patient can help. May operate tilt table and show how patient will be held. Demonstrates if appropriate to reassure patient that he or she will be held safely, in head-end down positions.

xi) Performer answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Attempts to develop a warm interaction with child. May hold patient; may speak to patient in calm, gentle voice; may provide clean pacifier or toy. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

xii) May tape R or L marker to patient if appropriate for use in spot filming.

xiii) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the body at the level and in the directions in which the central ray of the

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x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors.
After measuring, has patient rest in as relaxed a position as possible.

b. Performer informs radiologist when patient and/or equipment is ready. May bring requisition sheet, patient's medical history, chart, and any prior scans and films to radiologist. Displays radiographs on view boxes.

  i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.
  ii) Performer may accompany radiologist to examination room, make introductions or greet patient and/or staff.

c. During radiologist's review of requisition, prior radiographic materials and examination of patient, performer notes radiologist's orders:

  i) If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.
  ii) Notes radiologist's orders for scout film (if any) type of immobilization. Plans "plain film (s)" of the skull and/or spine in standard position or as ordered. May plan for PA and lateral exposures.

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4. If scout films are ordered, performer may proceed as follows:

  a. Makes sure that patient is being attended and sets up overhead equipment before positioning and immobilizing patient:

    i) Selects the speed, type of film, grid and cassette combinations appropriate to the scout, based on the area of interest, projection and equipment to be used. For lateral projections uses upright cassette holder with grid or grid front cassettes, and horizontal x-ray beam. Chooses size of cassette based on area of interest.
    ii) Identifies each cassette and places R or L marker as described earlier.
    iii) Places cassette for final positioning on table, in vertical cassette holder, or in bucky tray as appropriate.
    iv) Performer selects the exposure factors for each scout film, taking account of the measurements taken of the patient and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed, focal spot size, FFD and use or nonuse of other accessories (such as screens, grid, bucky, etc.). Converts factors if necessary as described earlier.
    v) For conventional exposure control sets milliamperage by choosing selectors for the correct focal spot size; sets the mA selected. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing

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the combination of major and minor kilovoltage settings to produce the desired kVp.

vi) For automatic phototimed exposure control selects and sets the category corresponding to the type of study and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming). May select and set a kVp range button (if called for with equipment) corresponding to range for examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

vii) Depending on the equipment, may set controls to provide for use of manual tableside adjustment of collimator, table and x-ray tube height and position (unless these have already been set).

viii) Performer may set the focal-film distance (if not already done). Operates controls or manually moves the x-ray tube into place. Checks the focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

b. Performer prepares the part to be radiographed in the final position selected for the first or next scout unless patient in traction is positioned by appropriate staff.

i) Performer may have patient assume a prone position on table or has patient placed in that position. Makes sure that there is cushioning under bony prominances.

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ii) Performer may place angle blocks and sponges or other support at the head end of the table at the specified angle depending on the area of interest (posterior fossa, cervical spine, thoracic, or lumbar spine) in anticipation of the amount of extension required of the head to prevent cranial entry of the contrast material.

iii) Performer centers part and keeps the long axis of the part parallel to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part. With upright holder, adjusts height of holder to part and centers part to film.

iv) For studies of the thoracic and/or lumbar spine, performer may plan to take advantage of "heel effect." If so, places anode end of x-ray tube at head end, and the cathode end of tube at the caudal end when positioning central beam.

v) Performer adjusts patient so that the median sagittal planes of the body and of the head are centered to the midline of the table and/or film holder. May support the torso to obtain better part-film contact, depending on area of interest. May have patient flex elbows and place arms in comfortable position. With infant may tape extremities into position. Adjusts shoulders so that they lie on a single transverse plane. Supports ankles. Adjusts head so that the median sagittal plane is at right angles to film or table. Immobilizes head with clamp, band, or webbing strap. May use extension cone attached

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to beam column to immobilize head.

c. Performer may position as follows depending on orders and area of interest:

i) For a lateral projection of the posterior fossa, adjusts cassette in laterally placed vertical holder on side of interest against cheek. Adjusts head so that the median sagittal plane is exactly parallel with the plane of the film. Directs the central ray horizontally at right angles to the film or as ordered, directed to the center of the area of interest such as the region of the mastoid process or a point just above the auricle.

ii) For PA projections (anterior views) of the posterior fossa, performer may place cassette on angle block. Has patient extend head and rest chin on cassette, centered to the area of interest to be projected by the central ray when it is properly angled. Centers cassette as described. Adjusts the angle of the central ray so that it enters the cassette at right angles. Directs central ray to the midline, at the level of the area of interest, such as just above the level of the auricles.

iii) For a lateral projection of the cervical spine, performer adjusts cassette in vertical position in upright holder so that lower portion is in contact with shoulder. Centers to the fourth cervical vertebra or area of interest, and immobilizes. May

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have patient assist in holding shoulders down. May have coworker depress shoulders by pulling on arms with symmetrical traction. Centers beam at right angles to film directed horizontally across table.

iv) For a PA projection (anterior view) of the cervical spine, maintains patient in prone position. May place pad under chest. Has patient flex elbows and place arms in comfortable position. Centers to the midline at the level of the area of interest. Directs central ray at right angles to the midpoint of the film.

v) For a lateral projection of the thoracic and/or lumbar spine, performer centers with patient in the prone position, with film centered to the mid-axillary line of the body at the level of the sixth thoracic vertebra or as ordered. Adjusts support so that vertebral column is parallel with film. Directs central ray at right angles to midpoint of film.

vi) For a PA projection (anterior view) of the thoracic and/or lumbar spine, performer centers to the midline at the level of the area of interest. Directs central ray at right angles to film.

d. Performer may rehearse coherent non-infant patient in holding breath and remaining motionless, or breathing out and holding, or observes patient's breathing and plans exposure for the appropriate quiet phase such as after expiration.

e. If not completed, performer immobilizes patient's body and head:

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- i) Makes sure head cannot be withdrawn from extended position in preparation for later positioning with contrast.
- ii) May place restraining bands as appropriate using additional strips of gauze and adhesive tape as appropriate.
- iii) After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

f. Performer checks final positioning using triangles, protractor and/or light in collimator.

- i) Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows as reference for center of field, and uses the collimator light to center the tube to the part.
- ii) Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust x-ray tube to provide better centering.

g. Once the patient has been positioned and immobilized, performer adjusts the collimator so as to expose only the area of interest as defined by radiologist.

- i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.
- ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

h. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination. Supplies anyone holding the patient (if absolutely necessary) or remaining in room with lead gloves and apron and makes sure he or she stays out of central beam. Explains if necessary that this is not cause for alarm but a general precaution to avoid unnecessary radiation exposure.

i. Performer makes the first or next exposure:

- i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.
- ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells patient when to hold breath, or breathe out and hold, or observes patient's breathing and times exposure to the appropriate quiet phase required.
- iii) Performer initiates exposure by pressing hand trigger or exposure control button.
- iv) While exposure is underway, performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.
- v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report;

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anticipates need to repeat exposure.

vi) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cut-off, or overexposure due to faulty timer).

vii) After exposure is completed, tells patient and any adult present that he or she can relax.

viii) After exposure performer returns to patient. Removes cassette from table, holder, or bucky. Removes any markers for further use.

j. Performer repeats radiography steps for all scout exposures ordered before review by radiologist, adjusting technical factors and x-ray tube as appropriate to each projection ordered. If other projections are ordered, proceeds as for plain films of the spinal cord or as described below in later steps.

k. Performer arranges to have the scout film(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

i) While film(s) are being processed, makes sure that patient is comfortable and attended by staff person or self.

ii) Performer brings the processed scout film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom. May display prior films as well.

5. During radiologist's review, performer notes orders for the conduct of the examination:

a. If radiologist decides to cancel or reschedule procedure, performer

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arranges to terminate or reschedule as described.

b. Performer notes whether radiologist requires a change in technical factors and/or patient positioning, centering, or central ray angulation for later overhead filming.

i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.

ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

iii) If overhead views during examination will be taken with table in Trendelenburg position, performer plans to position central ray in relation to the plane of the film at the angle required.

iv) If radiologist decides that additional preparatory steps are needed, performer may arrange to have these carried out and/or performer arranges to reschedule patient.

c. If radiologist will proceed, notes radiologist's final orders on sequence of examination.

i) Notes radiologist's decisions on site of puncture, use of general anesthesia, steps assigned to performer.

ii) Notes radiologist's final orders on type and amount of contrast, the spotfilm program, final decisions on materials to be used for puncture.

iii) Performer discusses sequence and timing of procedure with radiologist or clinician. May arrange

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signals for exposure, changing of spotfilm cassettes, operation of fluoroscopic exposure controls. Discusses how patient will be assisted or held.

iv) Adjusts technical factors and program for fluoroscopy and spot filming as ordered.

v) If check of needle position will be needed during surgical procedure, performer prepares cassette(s) with ID information as appropriate. May plan to use Polaroid cassette and processing equipment. May reset technical factors (or plans to reset after check of needle) for first overhead myelogram based on radiologist's review of scout film(s) and the presence of contrast.

6. Performer carries out preparations for myelography as ordered by radiologist based on the part of the work for which performer will be responsible. May carry out any or all of the following:

a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray,or decides to do personally.

i) May assist in preparation of puncture needles, syringes, local anesthetic.

ii) May have syringes prepared with contrast medium (iodized oil) or decides to do personally in amount ordered. Checks contrast for signs of chemical deterioration. May heat to room or body temperature.

b. If not already done, gives leaded gloves and apron to radiologist or clinician. If appropriate, places leaded curtain in place. Provides patient and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron. Makes sure assistant will stay out of primary beam.

c. If performer is to assist with preparation of patient for puncture, washes hands observing sterile technique when appropriate. May carry out any or all of the following:

i) If not already done, may arrange to have puncture site shaved and/or prepared.

ii) If patient is to have general anesthesia, performer awaits signal that procedure can begin.

iii) If not already done,sets up footboard and head and shoulder restraints on table.

iv) For lumbar puncture may assist patient to prone position or to lateral position with abdomen supported and spine flexed,depending on radiologist's orders.

v) For cisternal or cervical puncture,assists patient to lateral position with abdomen supported, knees drawn up and arms folded over chest. Performer elevates head so that the external occipital protuberance is in line with the spinous processes. Supports head in flexed position and extended forward.

vi) Immobilizes patient and reassures (if conscious).

vii) May swab puncture site area with antiseptic solution and cover surrounding areas with sterile towels. May receive or obtain a clean hospital gown, cotton "boots," cap, and mask. Dons these before approaching sterile

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area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids touching patient, drapes, radiologist, nurse, or instrument table with nonsterile object.

viii) Informs radiologist when patient and materials are ready.

7. During spinal puncture, performer may assist using sterile technique:

   a. May hand materials and supplies asked for using sterile technique.
   b. Makes sure fluoroscopic screen is in place and high enough over patient's back not to come in contact with needle.
   c. May assist with fluoroscopic viewing of needle:

      i) On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders.
      ii) For overhead check of needle placement, performer places cassette as indicated by radiologist. Sets technical factors as appropriate for location as for plain films. Collimates to area of interest and makes exposure. Has film processed at once or decides to do personally. Places for radiologist to view.
      iii) Continues as ordered until radiologist is satisfied with needle placement.

   d. Once needle is in place, performer checks that myelographic stop lock is in place and that fluoroscopic assembly cannot come down to strike the needle.
   e. May provide manometer when asked. May record spinal fluid pressure as dictated by radiologist.

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   f. As radiologist removes spinal fluid performer may hold prepared test tube or container while radiologist ejects contents in syringe into it; or receives test tube. May arrange to have specimen covered and prepared for laboratory, or decides to do personally.
   g. When ordered, positions patient as directed by radiologist. Checks shoulder and head restraints before the table is tilted.
   h. If performer is to be responsible for maintaining patient's head in extended position, dons leaded gloves as well as apron. Maintains head in fully extended or hyperextended position as directed.
   i. If performer is to assist with observation of contrast, proceeds as follows:

      i) Performer may assist in positioning of x-ray tube and/or tilt-table as ordered. Moves table slowly.
      ii) May operate fluoroscope and spotfilm controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders.
      iii) If spotfilms are made, and if spotfilm attachment uses cassettes, performer may unload as used, identify, and insert additional cassettes, as described above.
      iv) Depending on institutional procedures, performer may keep radiologist informed of cumulative exposure as shown on fluoroscope timer indicator.

   j. Performer may assist at any time with application of padding to puncture needle or removal of needle and dressing of site.
   k. Performer may have spotfilms processed at once:

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i) With cassette spotfilms, removes any markers for further use. Attaches ID card for use with flasher if appropriate.

ii) With spotfilm camera, performer advances the film so that all exposures made will be wound on the take-up spool in the roll film cassette. Uses device to cut film and create a light shield. Resets counter and removes film cassette.

iii) Arranges to have spotfilms processed at once or decides to process personally.

iv) When the spotfilms have been processed and returned, performer places on view boxes. May also hang prior films. Informs radiologist that radiograph(s) are ready.

v) Performer notes any orders for repeat of any part of fluoroscopic examination or, with posterior fossa, study of opposite side. Changes technical factors as ordered. May assist patient to raise head and inhale if so ordered. Assists in continued examination as described above, repeating appropriate steps.

8. After the fluoroscopic phase of the examination is completed, or at any time during the examination, performer may make overhead films as ordered:

a. Performer makes sure that patient's head is maintained in extended or hyperextended position. Makes sure not to touch puncture needle if still in place.

b. If projections are ordered with table in Trendelenburg position, and unless otherwise ordered, performer adjusts angulation of the x-ray tube so that central ray is at right angles to the film or the plane of the spine at the level of the area of interest.

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c. Performer may make projections as described earlier for scouts, or as ordered, similar to those for ventriculography or spinal cord study. For each projection adjusts technical factors as appropriate:

i) For oblique projections, adjusts position of cassette and central beam, or supports area of interest so that opposite side is raised to the desired angulation while head is maintained in extended position.

ii) When making exposure with patient under general anesthesia, performer may await signal from anesthesiologist that respiration has been suspended, make exposure, and indicate to anesthesiologist when respiration can be resumed.

iii) For each set of radiographs performer repeats appropriate steps, makes exposures, and presents to radiologist for review as described, and awaits further orders.

d. Throughout procedure performer remains alert to patient's condition.

i) Notes any signs of paleness, weak pulse, faintness, nausea.

ii) Notifies nurse or physician at once if patient shows emergency signs.

iii) Reassures patient. May provide damp cold towel, emesis basin. May clean patient.

e. Performer may assist with removal of oil contrast when so ordered:

i) May raise head end of table to 45° or as ordered.

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- ii) May assist with fluoroscopic check of pooling of contrast as described.
- iii) May reassure patient if removal is painful.
- iv) May supply materials for use of suction or additional puncture using sterile technique as described.
- v) May make horizontal beam lateral view to demonstrate removal when ordered. If so, proceeds as described with appropriate view of the area of interest.

9. When informed by the radiologist that the examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

   a. May assist while radiologist or nurse applies dressing to puncture site.
   b. Performer coordinates with anesthesiologist if present and/or other staff members responsible for recovery and after-care of patient. Removes any markers from patient's body. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room.
   c. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders additional examination.
   d. May check that spinal fluid sample has been prepared for laboratory, is properly identified, or decides to do personally. May present lab. order form to radiologist for signature.
   e. Performer records the examination according to institutional procedures. May include date, room, examination type, the spot and overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each view including spot-films and retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.
   f. Performer may record the fluoroscopic exposure including exposure time and rad dosage from posted data.
   g. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements.
   h. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures.
   i. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured,positioned;films identified;equipment set up for fluoroscopy, overheads;radiologist assisted with spinal puncture, instillation,fluoroscopy;overheads taken as ordered; radiographs processed,presented,repeated as ordered; examination recorded;radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Patient's x-ray requisition sheet, ID card, bracelet, medical-technical history,prior films;view boxes;pen; x-ray generator(s),control panel(s),tilt-table;x-ray tube(s);fluoroscopy unit,image intensifier;grid; bucky;cassettes;TV monitor;collimator;R-L, ID markers;sterile procedure tray for spinal puncture;emergency cart;leaded shielding,aprons,gloves;immobilization devices;technique,standard view,tube rating and rad exposure charts;phantom or test object;calipers;protractor;vertical cassette holder;iodine based contrast solution;syringes;gloves,masks,gowns,basin, towels;wax pen;wheelchair;stretcher;extension cones; tape,gauze band;scissors;padding;footboard;traction devices;stop lock; manometer

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.; radiologist; nurse; anesthesiologist; co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking diskograms of any pt., by reviewing request; measuring,preparing,reassuring pt.;setting up for fluoroscopy;assisting with spinal puncture,fluoroscopy;identifying films;collimating;applying shielding;setting technical factors;making overheads as ordered (single or biplane);having radiographs processed,reviewed;repeating,continuing as ordered; placing radiographs for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient identification card, and any appropriate medical-technical history for a patient scheduled for diskography (discography: positive contrast radiographic study of intervertebral disk (disc) after injection of contrast directly into the disk) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior plain film (s) or films of prior contrast studies.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for and the purpose:

      1) Notes the area of interest, such as cervical or lumbar spine. Notes whether fracture or dislocation of spine is involved, or possible

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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herniation of intervertebral disk(s).

- ii) Notes site of disk puncture.

b. Notes name of radiologist in charge, names of other staff members to assist, examination room, time scheduled.

c. Performer reads patient's name, identification number, sex, age, weight, height. Notes whether patient is in-patient, out-patient, or emergency patient.

d. Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as presence of accident injuries, unhealed fracture, suspected fracture, degenerating disease, presence of plaster cast, whether patient will be on a stretcher or in a wheelchair.

- i) Notes especially whether patient will arrive in traction. If so, the type of traction and whether it is to be maintained during procedure.
- ii) Notes whether performer will position patient or whether this will be done by team able to deal with acute injury to the spine.
- iii) If patient will not be in traction, notes whether body supports and/or other device will be in place.
- iv) Notes whether patient has prior history of allergic reaction to contrast or history of allergies.
- v) Notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.
- vi) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention.

e. Performer notes any orders for prior preparation of patient such as clearing of colon prior to lumbar puncture, shaving of area if cervical puncture will be done, prior medication or sedation of patient. Checks whether orders have been carried out and whether administration of medication was at appropriate time to allow for medication to take effect.

f. If patient has history of allergies, if female patient may be pregnant, if prior preparations have not been carried out, or if proper amount of time has not elapsed to allow medication to take effect, performer plans to report problem to radiologist or appropriate staff member, and/or arranges to have examination postponed as appropriate.

g. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment, and the examination ordered.

- i) Notes whether biplane equipment or two x-ray units will be required.
- ii) Notes appropriate sterile procedures required, appropriate shielding for the examination. Notes whether film processing equipment is available adjacent to procedure room.
- iii) Checks own clothing to make sure that performer is in compliance

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with institutional rules for safe, sanitary dress for the equipment and room to be used.

h. If referring physician has requested that prior films, test results already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have these delivered.

i. If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or immobilize patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer plans to notify supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary.

   a. Checks that room is equipped with a biplane unit or two x-ray units and a vertical cassette holder to permit frontal and lateral radiography without repositioning patient.
   b. Washes hands as appropriate. If not already done, has equipment cleaned for use in sterile procedure or decides to do personally.
   c. Performer reviews the technique chart for the machine(s) to be used and takes note of any newly posted changes in technical factors (to

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reflect accommodation for change in machine output or a policy decision).

      i) Locates information for the fluoroscopic and overhead projections likely to be involved given the area of interest, the examination involved and standards set by the institution.
      ii) Takes note of the exposure factors to be used for overheads and fluoroscopy. Considers preferences of the radiologist involved, conversions needed to account for patient's age, use of contrast, condition, or any newly posted changes.
      iii) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.
      iv) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

   d. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator(s) and checks that each indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for machine to "warm up."

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i) Makes sure that all circuits have been stabilized. If appropriate, checks each line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

ii) As appropriate, performer sets x-ray generator mode selector(s) to fluoroscopic mode, and/or for overhead filming as appropriate.

e. Sets up fluoroscopy equipment:

i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.

ii) If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

iii) If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

iv) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position.

v) If a grid will be used with the image intensifier for fluoroscopy, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

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vi) May adjust distance between focal spot and image intensifier (focal spot to film distance, FFD). May check that TOD is 15 inches or more.

vii) Performer may collimate fluoroscopy tube depending on nature of the equipment and controls. May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or may set shutter mode selector to automatic collimation.

f. If not already done, checks fluoroscopy mode. Operates controls in examination room behind leaded screen:

i) Makes sure no one is in room. Places phantom or appropriate test object on radiography table where patient's area of interest will be centered for examination.

ii) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.

iii) If not already done, moves image intensifier into position; centers (over or under) the area of interest.

iv) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.

v) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.

vi) Checks mA meter and notes whether appropriate reading is obtained.

vii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.

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viii) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

ix) After equipment has been checked, performer resets standard exposure factors. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

g. Checks that proper accessories are available for procedure:

i) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure and that appropriate shielding is available for placement between radiologist and the patient.

ii) Checks that appropriate immobilization devices for patient's area of interest,age and condition are present, and that there is a matress, pads, pillows and/or blankets for comfort of patient. May arrange to have patient kept warm during procedure.

iii) Makes sure that tilt-table is available. May set up footboard and/or attach shoulder padding supports, hand holds as appropriate for patient's age and size.

iv) Makes sure extension cones are available.

v) Attaches "myelogram stop lock" to fluoroscope assembly if not already done.

vi) Checks that emergency cart is available.

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vii) Checks for hospital gowns, masks, gloves to be worn for sterile procedure.

h. May check that procedure tray for the examination has been properly prepared or decides to do personally:

i) Depending on location of puncture site and patient's age, performer may check for appropriate types and sizes of double needles to be used for puncture, syringes, forceps, dressings. Notes whether appropriate antiseptic and local anesthetic solutions are present.

ii) Checks that appropriate aqueous,iodine-based contrast solution is present. Checks that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool.

iii) May check for emesis basin, towels, sterile drape.

i. Performer prepares cassettes for overheads:

i) Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Checks that these are loaded with appropriate speed and type of film and grid combinations depending on the projections and techniques to be used, type of equipment, and institutional practices. Selects size(s) based on the area(s) to be included, the views anticipated,and patient's size. If an adequate supply is

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not in room, arranges to obtain or decides to obtain personally.

ii) Performer prepares for identification of the films using equipment provided by institution.
May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.
Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write or type out ID information on card if not received with requisition.
Checks identification against requisition sheet.
May place identification card into card tray for equipment using automatic film marking device.

iii) Makes sure that right (R) and left (L) markers are available for use.

3. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, and prior films to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready.

a. If performer is to prepare patient in examination room, may proceed as follows:

i) Performer washes hands as appropriate. Depending on patient's condition or age may carry out isolation or decontamination techniques. May don gown, mask, gloves.

ii) Performer has the patient brought from holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.

iii) If patient is in traction frame, has appropriate staff members set up traction frame for filming or move patient to x-ray table while maintaining traction. May assist.

iv) Performer greets coherent patient and any accompanying staff person and introduces self.
Checks patient's identity against requisition sheet, referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

v) Makes patient comfortable on table or has this done if appropriate. If patient is on special stretcher, has stretcher placed so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.
If patient is in wheelchair may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.
Performer may decide to assist patient to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.
If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.
May have nurse carefully place infant in supine position on table, or lifts patient carefully, supporting infant's head, and places on table.

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vi) Makes sure patient is being attended and there is no danger patient will fall off table. If patient is in traction or has respiration, cardiac or infusion equipment attached, makes sure that equipment is being monitored.

vii) If not already done, has patient's dentures, hair pins, spectacles, and any jewelry removed. Makes sure that all garments are removed and that patient is in gown with opening in the back. Has infant kept warm as appropriate.

viii) If not already done, questions patient or accompanying adult about prior preparations and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

ix) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

x) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

xi) Performer attempts to reassure patient. May show how equipment will be used. Answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Attempts to develop a warm interaction with child. Remains aware that patient may be frightened and/or in pain. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age, or, if appropriate, level of functioning or coherence. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

xii) If there is a wet dressing, performer has it reinforced or decides to do personally.

xiii) If patient is in traction and/or there is any danger of fracture or dislocation, performer does not personally move or position patient.

xiv) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the body at the level and in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors.

xv) After measuring, has patient rest in as relaxed a position as possible.

b. Performer informs radiologist when patient and/or equipment is ready. May bring requisition sheet, patient's medical history, chart, and any prior films to radiologist. Displays radiographs on view boxes.

i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

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ii) Performer may accompany radiologist to examination room, make introductions or greet patient and/or staff. c. If not already done, performer joins radiologist, patient and other staff in examination room. d. During radiologist's review of requisition, prior radiographic materials, and examination of patient, performer notes radiologist's orders: i) If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate. ii) If radiologist decides that additional preparatory steps are needed, performer may arrange to have these carried out and/or performer arranges to reschedule patient. iii) If preliminary films have not already been made, and if radiologist orders scouts, performer carries out filming as for plain films of the spinal column or as described below in later steps. Notes any orders from radiologist on change in technical factors, tube angulation, position of patient for later use in overhead filming. iv) If radiologist will proceed, notes final orders on site of puncture, types and sizes of materials, type and amount of contrast, anesthetic, and steps assigned to performer. 4. Performer carries out preparations for diskography as ordered by radiologist based on the part of the work for	which performer will be responsible. May carry out any or all of the following: a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray, or decides to do personally. May assist in preparation of double puncture needles, syringes with anesthetic, aqueous iodine-based contrast in amounts ordered. Checks appearance of contrast for deterioration. b. If not already done, gives leaded gloves and apron to radiologist, and sterile gown, gloves, mask. If appropriate, places leaded curtain in place. Provides patient and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron, Makes sure assistant will stay out of primary beam. c. Performer prepares cassettes for overhead filming: i) If overhead check of needle position will be needed during surgical procedure, performer prepares cassette(s) with ID information as appropriate. May plan to use Polaroid cassette and processing equipment. ii) Performer identifies cassettes for frontal and lateral projections if not already done. iii) Places right or left marker on cassette holder or as appropriate to the equipment, or depresses appropriate R or L button for automatic marking. iv) If patient's identification information is in the form of lead numerals, places on appropriate corner of cassette.

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v) If patient's identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.

vi) Performer may place patient's card into card tray for equipment using automatic film marking device.

vii) Places cassette for final positioning on table in vertical cassette holder or in bucky as appropriate. If biplane filming is to be used, performer notes whether the exposures will be simultaneous or alternating and loads as appropriate. Moves vertical holder out of way of unit until fluoroscopy is completed.

d. Performer selects and sets the exposure factors for each overhead film taking account of the measurements made of the patient, the collimated field size to be used, the radiologist's orders, the presence of contrast and any posted changes:

i) Makes sure that technique relates to the combination of film type and speed, focal spot size, FFD, and use or nonuse of other accessories (such as screens, grid, bucky, etc.). Converts factors if necessary as described earlier.

ii) At control panel(s) checks that unit(s) are ready of use. Sets technical factors for the first frontal and/or lateral projections.

iii) For conventional exposure control sets milliamperage by choosing selectors for the correct focal spot size; sets the mA selected. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

iv) For automatic phototimed exposure control, selects and sets the category corresponding to the type of study and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming). May select and set a kVp range button (if called for with equipment) corresponding to range for examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.

v) Depending on the equipment, may set controls to provide for manual tableside adjustment of collimator, table and x-ray tube height, and position (unless these have already been set).

e. If performer is to assist with preparation of patient for puncture, washes hands observing sterile technique when appropriate. May carry out any or all of the following:

i) If not already done, may arrange to have puncture site shaved and/or prepared.

ii) If patient (pediatric) is to have general anesthesia, performer awaits signal that procedure can begin.

iii) May set up footboard and shoulder restraints on table. Places radiolucent support on table so

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that long axis of spine can be raised in horizontal position.

iv) For cervical spine puncture, performer may help position unless patient is in traction. Places patient in supine position with frontal access to the neck and shoulder areas, with head raised on a support so that spine is on a horizontal plane.

v) For lumbar puncture, places patient (or has patient in traction placed) in lateral position on radiolucent pad. Adjusts support under thorax so that the long axis of the spine is horizontal. May place support between upper and lower leg, allow patient to flex knees comfortably.

vi) Immobilizes patient and reassures if conscious.

vii) May swab puncture site area with antiseptic solution and cover surrounding areas with sterile towels.

viii) May receive or obtain a clean hospital gown, cotton "boots," cap, and mask. Dons these before approaching sterile area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids touching patient, drapes, radiologist, nurse, or instrument table with nonsterile object.

ix) Informs radiologist when patient and materials are ready.

5. During spinal puncture performer may assist using sterile techniques:

   a. May hand materials and supplies asked for using sterile technique.
   b. Performer checks that "myelographic stop lock" is in place and that fluoroscopic assembly cannot come down to strike the needle. Makes sure fluoroscopic screen is in place and high enough to avoid contact with needle.
   c. May assist with fluoroscopic viewing of needle. On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders. Continues as ordered.
   d. For overhead check of needle placement, performer places cassette as indicated by radiologist. If not already done, sets technical factors as appropriate for location as for plain film. Collimates to area of interest and makes exposure. Has film processed at once or decides to do personally. Places for radiologist to view. Continues as ordered until radiologist is satisfied with needle placement.
   e. May provide manometer when asked. May record spinal fluid pressure as dictated by radiologist.
   f. If performer is to assist with observation of contrast, proceeds as follows:

      i) Performer may assist in positioning of x-ray tube and/or tilt-table as ordered. Moves table slowly.
      ii) May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders.
      iii) Depending on institutional procedures, performer may keep radiologist informed of cumulative exposure as shown on fluoroscope timer indicator.

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g. When the instillation of the contrast is completed, performer notes radiologist's orders for overheads.

   i) Performer may assist with application of padding to puncture needle, or removal of needle and dressing of site.
   ii) May help place patient in supine position.

6. Performer makes overhead diskograms as ordered:

   a. Makes sure that patient is being attended, and sets up overhead equipment:

      i) Sets up biplane equipment for lateral and frontal views or places x-ray tube and cassette holders sequentially for exposures.
      ii) For lateral projection with patient in supine position, performer adjusts cassette in vertical position in upright holder in contact with side of interest. Centers cassette to area of interest and immobilizes. Positions x-ray tube for horizontal beam filming.
      iii) For AP projection with patient supine, performer places cassette in position under patient or in bucky tray and centers to the area of interest. Positions x-ray tube for vertical beam filming.
      iv) For lateral projection with patient retained in lateral position for lumbar puncture, performer places cassette in bucky tray in table; centers to the area of interest. Positions x-ray tube for vertical beam filming.

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      v) For AP or PA projection with patient in lateral position, places cassette in vertical holder in front of or behind patient, centered to area of interest. Positions x-ray tube for horizontal beam filming.

   b. Unless otherwise specified, positions as follows:

      i) For cervical intervertebral disks, may have patient or staff member assist in holding shoulders down. May loop bandage around patient's feet, have knees slightly flexed, and have patient grasp bandage ends and extend knees. May have co-worker depress shoulders by pulling on arms with symmetrical traction.
      ii) For lateral cervical spine projection, positions cassette as close to area of interest as possible, with lower portion of vertically placed cassette in contact with shoulder on side of interest.
      iii) For AP cervical spine projection, may direct central ray at 10° cephalad or as ordered.
      iv) For lumbar intervertebral disks, may adjust supine patient by having thighs flexed so that back is in contact with table (with dressing and/or padded needle in place at puncture site).
      v) For AP lumbar spine projection, may direct central ray at 10° to 20° cephalad or as ordered.
      vi) Performer keeps the long axis of the part parallel to the film holder. When using a bucky, centers patient to midline. With cassette on table top,

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centers film to part. With upright holder, adjusts height of holder to part and centers part to film. Adjusts median sagittal plane of body so that it is at the midline or parallel to plane of film, or has this done.

vii) Performer sets the focal film distance for each unit (if not already done). Operates controls or manually moves each x-ray tube into place at right angles to upright holders. Checks the focal-film distances by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

c. Performer completes immobilization of patient:

  i) May place restraining bands as appropriate using strips of gauze and adhesive tape as appropriate.
  ii) After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

d. Performer may have patient practice holding breath or breathing out and holding breath when ordered until told to relax, or observes patient's respiration and plans to make exposure at the rest phase of respiration.

e. Performer checks final positioning. Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the part to the film holder and the tube to the part. Rechecks angulation of central ray. Checks that the primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust x-ray tube position to provide better centering.

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f. Performer provides appropriate collimation and shielding:

  i) Once the patient has been positioned and immobilized, performer adjusts the collimator. Collimates so as to expose only the area of interest (and thus provide maximum protection and detail). May use extension cone. Adjusts primary beam to minimum size needed to cover the area of interest.
  ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.
  iii) If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination. Makes sure that anyone holding the patient (if absolutely necessary) or remaining in room has lead gloves and apron and stays out of central beam.

g. Performer makes the first or next exposure:

  i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

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ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells patient when to hold breath, or breathe out and hold, or observes patient's breathing and times exposure to the appropriate quiet phase required. With a patient under general anesthesia, coordinates with anesthesiologist and makes exposure on signal.

iii) Performer initiates exposure by pressing hand trigger or exposure control button.

iv) While exposure is underway, performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.

vi) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cut-off, or overexposure due to faulty timer).

vii) After exposure is completed, tells patient and any adult present that he or she can relax.

viii) After exposure performer returns to patient. Removes cassette from table, holder, or bucky. Removes any markers for further use.

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h. Performer repeats radiography steps for all exposures ordered before review by radiologist, adjusting technical factors and x-ray tube as appropriate to each projection ordered.

i. Performer arranges to have the exposure(s) processed at once or decides to do personally:

i) Attaches ID card for use with flasher if appropriate. May sign requisition.

ii) While films are being processed, makes sure that patient is comfortable and attended by staff person or self.

iii) Performer brings the processed film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom. May display prior films as well. Informs radiologist when the films are ready.

j. Performer awaits radiologist's orders for repeat of any part of the examination.

i) As appropriate, repeats radiography as ordered, adjusting technical factors for overheads as appropriate.

ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

iii) Assists as described above for additional injection of contrast and fluoroscopy.

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k. Depending on radiologist's orders, performer may carry out radiography for additional patient positions:

  i) For lateral projections of forward and backward bending positions of lumbar intervertebral disks, performer has patient stand in lateral position in front of upright film holder. Centers as for conventional lateral view, and, with vertical holder, centers to the level of the iliac crests or as ordered. Performer instructs patient to bend forward as much as possible without support and without moving hips for first exposure, and to bend backward as much as possible without support or hip movement for second exposure. May use restraining band. Directs central ray at right angles to center of film.

  ii) For oblique projections, starts from supine position and raises and supports the side opposite the side of interest to achieve the angulation with the table ordered by radiologist. Directs the central ray at right angles to the film. Alternatively, may maintain patient in supine position and direct central ray to the area of interest at the oblique angle ordered.

l. Throughout procedure performer remains alert to patient's condition. Notes any signs of paleness, weak pulse, faintness, nausea or other adverse reaction. Notifies nurse or physician at once if patient shows emergency signs. Reassures patient. May provide damp cold towel, emesis basin. May clean patient.

m. For each set of radiographs performer repeats appropriate steps, makes exposures, and presents to radiologist for review as described, and awaits further orders.

7. When informed by the radiologist that the examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

  a. May assist while radiologist or nurse applies dressing to puncture site.
  b. Coordinates with the staff members responsible for recovery and aftercare of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room.
  c. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders delayed films or additional examination.
  d. Performer records the examination according to institutional procedures. May include date, room, examination type, the serial overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.
  e. Performer may record the fluoroscopic exposure including exposure time and rad dosage from posted data.
  f. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally,

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depending on institutional arrangements. g. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. h. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

TASK DESCRIPTION SHEET

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1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt reassured,measured,positioned;films identified;equipment set up for fluoroscopy,tomography,overheads;radiologist assisted with puncture,instillation,fluoroscopy;overhead myelograms and tomograms taken as ordered; radiographs processed,presented,repeated as ordered;examination recorded;radiographs placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Patient's x-ray requisition sheet, ID card,bracelet, medical-technical history,prior films;view boxes; pen;x-ray generator(s),control panels,tilt-table; x-ray tube(s);fluoroscopy unit,image intensifier; grid;bucky;tomography unit;cassettes;TV monitor;collimator;R-L,level,ID markers;sterile procedure tray for spinal puncture;emergency cart;leaded shielding, aprons,gloves;immobilization devices;technique,standard view,tube rating and rad exposure charts;phantom or test object;calipers;protractor;vertical cassette holders;specimen test tube,label;gloves,masks, gowns;basin,towels,wax pen;wheelchair;stretcher;extension cones;tubing;tape,gauze,bands;scissors;padding;shoulder supports,harness;footboard;manometer; stop lock

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.; radiologist; nurse; co-worker; anesthesiologist

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking air or gas contrast myelograms of any pt., by reviewing request;measuring,reassuring,preparing pt. for puncture;setting up for fluoroscopy,overhead films,tomography;assisting with puncture,fluoroscopy;identifying films;collimating;applying shielding;setting technical factors;making overhead and tomographic exposures as ordered;having films processed,reviewed;repeating,continuing as ordered; placing radiographs for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient identification card, and any appropriate medical-technical history for a patient scheduled for air or gas myelography (radiographic study of the subarachnoid spaces of the spinal canal after instillation of air or gas as contrast medium) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior plain film (s) or films of prior contrast studies.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for and the purpose:

      i) Notes the area of interest, such as cervical or lumbar spine, site of puncture, such as cisternal or lumbar area.
      ii) Notes whether tomography will be involved.

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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b. Notes name of radiologist in charge, names of other staff members to assist, examination room, time scheduled. Reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is in-patient, out-patient, or emergency patient.

c. Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as patient arriving in traction, presence of respiration or heart disease, communicable or infectious condition, presence of IV drip, behavioral disorder, incoherence.

  i) Notes whether patient will be arriving on stretcher, wheelchair, traction frame, will be accompanied by nurse, other staff.
  ii) Notes whether performer will position patient or whether this will be done by nurses or radiologist.

d. Notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.

e. Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether there is history of extensive radiography to be brought to radiologist's attention.

f. Performer notes any orders for prior preparation of patient such as clearing of colon prior to lumbar myelography, shaving of site if cisternal puncture will be done, prior medication or sedation of patient. Checks whether orders have been carried out, and whether administration of medication was at appropriate time to allow for medication to take effect.

g. If female patient may be pregnant, or if prior preparations have not been carried out, or if proper amount of time has not elapsed to allow medication to take effect, performer plans to report problem to radiologist or appropriate staff member, and/or arranges to have examination postponed as appropriate.

h. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment and the examination ordered.

  i) Notes appropriate sterile procedures required, appropriate shielding for the examination. Notes whether film processing equipment is available adjacent to procedure room.
  ii) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.
  iii) If tomography is ordered, notes whether tube-film travel pattern is specified (if more than one type of equipment is available), such as linear, circular, elliptical, or hypocycloidal tomography. Notes whether zonography (exposure angle of 10° or less), or plesiotomography (simultaneous multi-level tomography using "book" cassette) is called for.

i. If referring physician has requested that prior films, test results already on file be sent with cur-

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rent radiographs, and if not already with patient's jacketed material, performer arranges to have these delivered.

j. If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or immobilize patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer plans to notify supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

2. Performer goes to appropriate room for the type of examination involved and the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary.

   a. Checks that room is equipped with tomographic tilt table or appropriate unit.
   b. Washes hands as appropriate. If not already done, has equipment cleaned for use in sterile procedure or decides to do personally.
   c. Performer prepares for identification of the films using equipment provided by institution:

      i) May obtain lead numerals and tape and prepares identification strip for placement on film holder(s) giving appropriate patient identification information.
      ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write out ID information on card if not received with requisition.
      iii) Checks identification against requisition sheet.
      iv) May place identification card into card tray for equipment using automatic film marking device.
      v) Makes sure that right (R) and left (L) markers are available for use and identification cards or leaded markers or numerals for film identification (and recording of level and amplitude for tomography).

   d. Performer preselects the technical factors likely for the overhead films and tomograms to be taken and for fluoroscopy:

      i) Performer reviews the technique chart for each machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).
      ii) Locates information for the fluoroscopic, overhead, and tomographic projections likely to be involved given the area of interest, the examination involved, and standards set by the institution.
      iii) Takes note of the exposure factors to be used. Considers preferences of the radiologist involved, conversions needed to account for patient's age, condition, use of gas or air control, or any newly posted changes.
      iv) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart

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to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate. v) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs,minimizing exposure time. e. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator(s) and checks that each indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for machine(s) to "warm up." i) Makes sure that all circuits have been stabilized. If appropriate, checks each line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter. ii) As appropriate, performer sets x-ray generator mode selector(s) to fluoroscopic mode, and/or for overhead filming and tomography at appropriate point in procedure. f. Sets up fluoroscopy equipment: i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room. ii) If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.	iii) If appropriate, performer selects the proper field size selector (if there is dual image intensifier). iv) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position. v) If a grid will be used with the image intensifier for fluoroscopy,performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube. vi) May adjust distance between focal spot and image intensifier (focal spot to film distance, FFD). May check that TOD is 15 inches or more. vii) Performer may collimate fluoroscopy tube depending on nature of the equipment and controls. May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or may set shutter mode selector to automatic collimation. g. If not already done,checks fluoroscopy mode. Operates controls in examination room behind leaded screen:

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i) Makes sure that no one is in room.

ii) Places phantom or appropriate test object on radiography table where patient's area of interest will be centered for examination.

iii) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.

iv) If not already done, moves image intensifier into position; centers (over or under) the area of interest.

v) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.

vi) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.

vii) Checks mA meter and notes whether appropriate reading is obtained.

viii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.

ix) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

x) After equipment has been checked performer shuts and resets selected exposure factors. If performer decides that any of the fluoroscopic equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

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h. Sets up and checks tomography equipment as appropriate:

i) If institution has polytomography unit, sets mode corresponding to appropriate tube-film travel pattern and sets up as appropriate to mode selected.

ii) If a tomography attachment is to be put in place (to be used with conventional tubemount, generator, and horizontal bucky x-ray table), performer obtains the necessary equipment and assembles. Checks that table is in horizontal position. Attaches fulcrum assembly along the table top rail at head end of table and secures. Attaches fulcrum assembly plug to appropriate electrical receptacle. Attaches the fulcrum bar and bucky link bar as appropriate to equipment and moves the tubemount over the fulcrum assembly. Adjusts so that angulation and fulcrum level indicators are facing appropriately. Slides fulcrum bar into fulcrum assembly as appropriate and locks. Adjusts tubemount to prescribed focal-film distance. (May check technique chart for tomography.)

iii) Moves the tomographic mechanism manually through the maximum travel and checks that there are no restrictions such as from cables or other attachments. Adjusts as appropriate.

iv) Engages the drive mechanism for horizontal travel and removes engaging rod. Sets lock switch if appropriate to prevent alternative travel motion. Returns table to horizontal position.

v) Makes sure that tomography power switch is off (if appropriate).

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i. Checks and sets up accessory equipment:

   i) Sets up footboard and attaches harness or shoulder padding supports to tilt-table as appropriate to patient's age and size.
   ii) Attaches myelogram stop lock to fluoroscope assembly if not already done.
   iii) Checks that extension cones and vertical cassette holder are available.
   iv) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure, and that appropriate shielding is available for placement between radiologist's hands and the patient.
   v) Checks that appropriate immobilization devices for patient's age, area of interest and condition are present, and that there is a mattress, pads, pillows and/or blankets for comfort of patient. May arrange to have infant kept warm during procedure.
   vi) Checks that emergency cart is available.
   vii) Checks for hospital gowns, masks, gloves to be worn for sterile procedure.

j. Checks that procedure tray for the examination has been properly prepared or decides to do personally:

   i) Checks that sterile spinal puncture materials of appropriate sizes for patient's age and puncture site are present.
   ii) May check for sterile plastic extension tubing, emesis basin, towels, sterile drape, local anesthetic, antiseptic solutions, syringes, dressings.

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   iii) May check that label and sterile container for spinal fluid specimen is prepared or decides to do personally. May check that monometer is present.

k. Performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes for conventional overheads and tomography are available in the examination room(including book cassettes if appropriate).

   i) Checks that these are loaded with appropriate speed and type of film and grid combinations depending on the projections and techniques to be used, type of equipment, and institutional practices.
   ii) Selects size(s) based on the area(s) to be included, the views anticipated,and patient's size.
   iii) If an adequate supply is not in room, arranges to obtain or decides to obtain personally.

3. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, and prior plain or contrast films to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready.

   a. If performer is to prepare patient in procedure room,may proceed as follows:

      1) Performer washes hands as appropriate. Depending on patient's condition or age,may carry out isolation or decontamination techniques. May don gown, mask, gloves.

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ii) Performer has the patient brought from holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room. If patient is in traction,makes sure that only trained staff move patient.

iii) Performer greets patient and any accompanying staff person and introduces self. Checks patient's identity against requisition sheet referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

iv) Makes patient comfortable on table or has patient in traction placed as appropriate. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table.
If patient is in wheelchair may move patient in chair into position next to table. Makes sure that wheelchair is in locked position. Performer may decide to assist patient to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.
If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table. May have nurse carefully place infant in supine position on table, or lifts patient carefully, supporting infant's head, and places on table.

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v) Makes sure patient is being attended and there is no danger patient will fall off table. If patient has traction, respiration, cardiac or infusion equipment attached, makes sure that equipment is being monitored.

vi) If not already done, has patient's dentures, hair pins, spectacles, and any jewelry removed. Makes sure that all garments are removed and that patient is in gown with opening in the back. Has infant kept warm as appropriate.

vii) If not already done, questions patient or acompanying adult about prior preparations.

viii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

ix) If any preparatory procedures were not carried out,or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

x) Performer may describe the procedure to the patient. May describe how the tilt table will be used, how head will be maintained in an extended position, and how patient can help. May operate tilt table and show how patient will be held. Demonstrates if appropriate to reassure patient that he or she will be held safely in head-end down positions. May manually demonstrate the action of the x-ray tube during tomography.

xi) Performer answers patient's nonmedical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern

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regardless of patient's behavior. Attempts to develop a warm interaction. Remains aware that patient may be frightened and/or in pain. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

xii) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the body at the level and in the directions in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors. After measuring, has patient rest in as relaxed a position as possible.

b. Performer informs radiologist when patient and/or equipment is ready. May bring requisition sheet, patient's medical history, chart, and any prior or preliminary films to radiologist. Displays radiographs on view boxes.

  i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

  ii) Performer may accompany radiologist to examination room, make introductions or greet patient and/or staff.

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c. If not already done, performer joins radiologist, patient and other staff in examination room.

d. During radiologist's review of requisition, prior radiographic materials and examination of patient, performer notes radiologist's orders:

  i) If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.

  ii) If radiologist decides that additional preparatory steps are needed, performer may arrange to have these carried out and/or performer arranges to reschedule patient.

  iii) If preliminary films have not already been made, and if radiologist orders scout films, performer carries out filming as for plain films of the spinal column or as described below in later steps. Has preliminary films processed and presents for review. Notes any orders from radiologist on change in technical factors, tube angulation, or positions of patient for later use.

  iv) If radiologist will proceed, notes final orders on site of puncture, types and sizes of materials, local anesthetic, and steps assigned to performer.

  v) Performer discusses sequence and timing of procedure with radiologist. May arrange signals for exposure, operation of fluoroscopic exposure controls. Discusses how table will be positioned.

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4. Performer carries out preparations for air or gas myelography as ordered by radiologist based on the part of the work for which performer will be responsible. May carry out any or all of the following:

   a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray,or decides to do personally. May assist in preparation of puncture needles, syringes, local anesthetic.

   b. If not already done, gives leaded gloves and apron to radiologist, sterile gown,gloves, mask. If appropriate, places leaded curtain in place. Provides patient and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member, will be asked to assist, performer provides leaded gloves and apron. Makes sure assistant will stay out of primary beam.

   c. Performer prepares cassettes for overhead filming:

      i) If overhead check of needle position will be needed during surgical procedure, performer prepares cassette with ID information as appropriate. May plan to use Polaroid cassette and processing equipment.

      ii) Performer identifies cassettes for frontal and lateral projections if not already done.

      iii) Places right or left marker on cassette holder or cassette as appropriate to the equipment or depresses appropriate R or L button for automatic marking.

      iv) If patient identification information is in the form of lead numerals, performer places on appropriate corner of cassette.

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      v) If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.

      vi) Performer may place patient's card into card tray for equipment using automatic film marking device.

      vii) Places cassette for final positioning on table in vertical cassette holder or in bucky as appropriate. Moves vertical holder out of way of unit until fluoroscopy is completed.

   d. Performer may preset technical factors for overheads:

      i) Takes account of the measurements made of the patient, the radiologist's orders after viewing scout films (if any), the collimated field size to be used, presence of air contrast, and any conversions necessary. Converts factors as described earlier.

      ii) Makes sure that technique relates to the combination of film type and speed, focal spot size, FFD and use or nonuse of other accessories (such as screens, grid, bucky, etc.).

      iii) If overhead filming will be used for check of needle placement, performer presets factors as for plain films,and resets for myelograms when appropriate.

      iv) For conventional exposure control sets milliamperage by choosing selectors for the correct focal spot size; sets the mA selected. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovol-

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tage settings to produce the desired kVp. v) For automatic phototimed exposure control selects and sets the category corresponding to the type of study and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming). May select and set a kVp range button (if called for with equipment) corresponding to range for examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made. vi) Depending on the equipment, may set controls to provide for manual tableside adjustment of collimator, table and x-ray tube height and position (unless these have already been set). e. If performer is to assist with preparation of patient for puncture, washes hands observing sterile technique when appropriate. May carry out any or all of the following: i) If not already done, may arrange to have puncture site shaved and/or prepared. ii) If patient (pediatric) is to have general anesthesia, performer awaits signal that procedure can begin. iii) If not already done, places radiolucent support on table so that long axis of spine can be raised to horizontal position. Sets up footboard and shoulder restraints on table if not already done.	iv) Unless patient is to be positioned by nurse or MD, performer positions according to radiologist's orders. v) For cisternal puncture assists patient in lateral position with abdomen supported, knees drawn up, and arms folded over chest. Performer elevates head so that the external occipital protuberance is in line with the spinous processes. Supports head in flexed position, extended forward. vi) For lumbar puncture, places patient in prone position or in lateral position with abdomen supported and spine flexed, depending on radiologist's orders. For lateral positioning adjusts support under lumbar region so that the long axis of spine is horizontal. May place support between upper and lower leg; allows patient to flex knees comfortably. vii) Immobilizes patient and reassures if conscious. viii) May swab puncture site area with antiseptic solution and cover surrounding areas with sterile towels. ix) May receive or obtain a clean hospital gown, cotton "boots," cap, and mask. Dons these before approaching sterile area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids touching patient, drapes, radiologist, nurse, or instrument table with nonsterile object. x) Informs radiologist when patient and materials are ready. 5. During spinal puncture performer may assist using sterile technique:

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a. May hand materials and supplies asked for.

b. Performer checks that "myelographic stop lock" is in place and that fluoroscopic assembly cannot come down to strike the needle.

c. May assist with fluoroscopic viewing of needle. On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls adjusting kVp and/or mA according to radiologist's orders. Continues as ordered.

d. For overhead check of needle placement, performer places cassette as indicated by radiologist:

  i) Sets technical factors appropriate for location as for plain films.
  ii) Collimates to area of interest and makes exposure.
  iii) Has film processed at once or decides to do personally. Places for radiologist to view.
  iv) Continues as ordered until radiologist is satisfied with needle placement.

e. May provide manometer when asked. May record spinal fluid pressure as dictated by radiologist.

f. As radiologist removes spinal fluid, performer may hold prepared test tube or container while radiologist ejects contents in syringe into it; or receives test tube. May arrange to have specimen covered and prepared for laboratory, or decides to do personally.

g. When ordered by radiologist, performer may assist with introduction of air or gas contrast and any further removal of spinal fluid:

  i) When ordered may position patient as directed by radiologist. Checks shoulder and head restraints before the table is tilted.
  ii) Operates tilt-table slowly as ordered for removal of fluid by gravity and moves table when ordered so that patient is in head-down position.
  iii) May operate fluoroscope controls adjusting kVp and/or mA controls according to radiologist's orders.
  iv) Depending on institutional procedures, performer may keep radiologist informed of cumulative exposure as shown on fluoroscope timer indicator.

h. When appropriate, performer may assist with application of padding to puncture needle, or removal of needle and dressing of site.

i. When the instillation of the air or gas is completed, performer notes radiologist's orders for overheads.

  i) Notes the portions of the spinal cord to include, the tube-film angulation, and the projections required.
  ii) Unless otherwise ordered, plans for frontal and lateral projections with patient in lateral position.
  iii) Notes whether table is to be maintained in Trendelenburg position. If so, plans to direct central ray to film at angle specified regardless of the angle of the table.

6. Performer makes the negative contrast myelograms as ordered:

  a. Makes sure that patient is attended.

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i) Sets technical factors, identifies and places cassette for each exposure before immobilizing patient.

ii) Sets the focal-film distance if not already done as appropriate for unit, projection, and standards for examination. Operates controls or manually moves x-ray tube into place. Checks the focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

b. Unless patient is to be positioned by nurse or radiologist, performer adjusts patient in lateral position as for lumbar puncture:

i) May have patient or staff member assist in holding patient's shoulders down. May loop bandage around patient's feet, have knees slightly flexed, and have patient grasp bandage ends and extend knees. May have co-worker depress shoulders by pulling on arms with symmetrical traction.

ii) Performer may plan to take advantage of "heel effect." If so, places x-ray tube so that its long axis is parallel with the midline of table, with the anode at the head (cranial) end of the patient, and the cathode at the foot (caudal) end.

iii) Keeps the long axis of the spine parallel to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part. With upright holder, adjusts height of holder to part and centers part to film.

c. Unless otherwise specified, sets up as follows:

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i) For lateral projection of spine, places cassette in bucky tray centered to the level of the area of interest, with mid-axillary line of body centered to midline. Positions x-ray tube for right-angle filming to the plane of the film by adjusting to compensate for any angulation of table.

ii) For AP or PA projections of spine with patient in lateral position, places cassette in vertical holder in front of or behind patient, centered to area of interest. Directs central ray horizontally to the midpoint of film or as ordered.

iii) For AP cervical spine projection, may direct central ray at 10° cephalad, at right angles, or as ordered.

iv) For AP lumbar spine projection, may direct central ray at 10° to 20° cephalad, at right angles, or as ordered.

d. Performer completes immobilization of patient:

i) May place restraining bands as appropriate using strips of gauze and adhesive tape as appropriate.

ii) After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

e. Performer may have patient practice holding breath, or breathing out and holding breath when ordered, until told to relax, or observes patient's respiration and plans to make exposure at the rest phase of respiration. If patient is under general anesthesia, coordinates with

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anesthesiologist and plans to make exposure on signal from anesthesiologist.

f. Performer checks final positioning. Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the part to the film holder and the tube to the part. Rechecks angulation of central ray. Checks that the primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust x-ray tube position to provide better centering.

g. Performer provides appropriate collimation and shielding:

  i) Once the patient has been positioned and immobilized, performer adjusts the collimator. Collimates so as to expose only the area of interest (and thus provide maximum protection and detail). May use extension cone. Adjusts primary beam to minimum size needed to cover the area of interest.
  ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.
  iii) If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination. Makes sure anyone holding the patient (if absolutely necessary) or remaining in room has lead gloves and apron and stays out of central beam.

h. Performer makes the first or next exposure:

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  i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.
  ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells patient when to hold breath, or breathe out and hold, or observes patient's breathing and times exposure to the appropriate quiet phase. If patient is under general anesthesia, waits for signal from anesthesiologist.
  iii) Performer initiates exposure by pressing hand trigger or exposure control button.
  iv) While exposure is underway, performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.
  v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
  vi) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cut-off, or overexposure due to faulty timer).
  vii) After exposure is completed, tells patient and any adult present that he or she can relax.
  viii) After exposure performer returns to patient. Removes cassette from table, holder or bucky. Removes any markers for further use.

i. Performer repeats radiography steps for all exposures ordered before

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review by radiologist, adjusting technical factors and x-ray tube as appropriate to each projection ordered.

j. Performer arranges to have the film(s) processed at once or decides to do personally:

  i) Attaches ID card for use with flasher if appropriate. May sign requisition.
  ii) While films are being processed, makes sure that patient is comfortable and attended by staff person or self.
  iii) Performer brings the processed film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom. May display prior films as well. Informs radiologist when the films are ready.

7. Performer notes radiologist's orders for a repeat of any part of the examination and/or for tomography:

  a. For additional instillation of air or gas and fluoroscopy, performer assists as described above, as appropriate.
  b. For additional myelograms or "retakes" performer notes radiologist's orders on change in technical factors, position of table, x-ray tube angulation, centering and/or projections to be made.

    i) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."
    ii) For each set of myelograms, performer repeats appropriate steps,

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makes exposures, and presents to radiologist for review as described, and awaits further orders.

  c. Throughout procedure performer remains alert to patient's condition. Notes any signs of paleness, weak pulse, faintness, nausea or other adverse reaction. Notifies nurse or physician at once if patient shows emergency signs.
  d. If radiologist orders tomography, performer notes orders for the level of the initial cut (lowest probable cm.) and a second and/or third cut at somewhat higher levels, if so ordered. Notes the speed, size of the "slice" (exposure angle or amplitude), and the number or preliminary tomograms required.

8. If performer is to carry out tomographic myelography, maintains patient in lateral position on table at appropriate table angulation.

  a. Prepares and places cassette:

    i) Performer selects and identifies cassette for tomography as described earlier. Prepares marker giving the level at which the fulcrum will be set for the given exposure and attaches to cassette as appropriate.
    ii) Performer places cassette into bucky tray. May manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot. Makes sure that bucky carriage is in center of bucky slot.

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b. Performer sets the fulcrum (layer height) level for the first (or next) exposure:

  i) If a "book" cassette is to be used, performer sets the fulcrum level to coincide with the uppermost body layer to be projected.
  ii) If an automatic layer height selector is available, performer sets the controls to the interval distances selected, and sets the fulcrum for the uppermost or lowermost body layer desired depending on the direction of the automatic change.
  iii) Sets the fulcrum level using hand crank or power switch and checks the setting on the fulcrum (layer height) indicator.

c. Performer sets the amplitude (sweep):

  i) Makes sure that x-ray tube is centered at zero angle. Checks focal-film distance.
  ii) Sets the prescribed exposure angle or amplitude as appropriate to equipment and checks angle on indicator.

d. Performer sets the sweep speed as prescribed, according to the speeds available for the equipment, the exposure angle selected, and established procedure for the area of interest (or patient's age). Notes the duration or actual exposure time as the product of the angle and the sweep speed selected.

e. Sets directional control:

  i) For linear tomography, performer sets the directional control switch to right or left for horizontal travel.

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  ii) For asymmetrical exposure, determines whether the arc to be used will be at the beginning of tube travel or near the end, and adjusts equipment as appropriate.
  iii) For other types of tube-film travel motion, performer sets the selector(s) as appropriate for direction control (if any).

f. Performer selects and sets the exposure factors for the first tomographic projection by consulting the technique chart(s) posted for the machine dealing with tomography as described earlier for overheads.

  i) Locates the information needed for the body part and projection involved according to the exposure angle (amplitude), and speed selected. May first refer to conventional exposure factors in order to convert if commercial technique chart is used, or reads tomography mAs or mA and kVp directly from the technique chart.
  ii) Sets backup timer at an increment slightly longer than the actual exposure time (calculated as the product of the angle of amplitude and the sweep speed or as listed on chart).

g. Performer rehearses patient in proper breathing for exposure.

  i) Cautions patient to keep fingers away from table edges.
  ii) Advises patient to keep eyes closed to avoid following the movement of the x-ray tube.
  iii) Explains that patient must hold position for successive "cuts."

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- iv) Performer checks that no obstructions are present which might restrict tubemount travel.

h. Performer immobilizes patient; collimates and checks shielding as appropriate.

i. Performer tests tomographic set-up by proceeding with tubemount sweep but not activating exposure. Has patient practice breathing and holding still as ordered and permits patient to sense the duration time for each sweep:

- i) Turns on power for tomographic attachment or mode. Using appropriate switch, activates tomographic sweep action without activating exposure, and holds until tubemount reaches the extreme limit of travel.
- ii) Returns tubemount to other extreme position, holding until tubemount travel is complete. Interrupts travel at any point and makes any adjustments necessary. Returns equipment to "start" position.

j. Prepares for exposure as described earlier, telling patient when to breath or coordinating with patient's quiet breathing or anesthesiologist's signal.

- i) Performer initiates tubemount action and exposure by pressing hand trigger or exposure control button (twice if two stage control is appropriate). Holds down or continues to press exposure control until tube travel is completed. Then releases exposure switch at once.
- ii) For asymmetrical exposure initiates exposure or terminates at appropriate stage of tube travel.
- iii) If there is any problem during the exposure, performer releases switch at once and sets back to "start" position before attempting another sweep.

k. After exposure, performer returns to patient. Removes cassette from bucky.

- i) Removes any markers.
- ii) Performer places ID, R-L and appropriate next layer height markers on cassette for next exposure (unless book cassette was used).
- iii) Inserts new cassette as described.
- iv) Changes fulcrum to new layer height (level) as appropriate, unless this will be done automatically.
- v) Performer continues until all tomogram exposures ordered have been made.
- vi) Performer arranges to have the first tomograms processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition. While films are being processed, makes sure that patient is comfortable and attended by staff person or self.
- vii) Performer brings the processed set of tomograms directly to the radiologist in charge or places on view boxes and informs radiologist that they are ready. May also hang conventional myelograms.

l. Performer notes instructions from radiologist regarding the position and the layer levels, amplitude, and number of cuts to be made. Notes radiologist's preference for technical factors.

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m. Depending on radiologist's orders, performer makes tomographic exposures at the selected interval cuts (amplitude) and levels required as described above.

   i) Readjusts fulcrum level, technical factors, collimation and shielding as appropriate. Makes sure ID, R-L and layers heights are marked. Makes exposures and has tomograms processed at once as above.
   ii) Brings tomograms to radiologist and displays on view boxes as before.
   iii) Performer notes whether a given level will be further defined [illegible] smaller "slices" (expanded amplitude) within a more restricted area. If so, repeats procedures after adjusting amplitude and redetermining exposure techniques.
   iv) Performer shows subsequent sets of tomograms to radiologist as processed, and proceeds as described above until radiologist indicates that tomographic examination is completed.
   v) Turns off energy for tomographic attachment and/or unplugs.
   vi) With tomographic attachment, disassembles by reversing the attachment procedures.

9. When informed by the radiologist that the examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

   a. May assist while radiologist or nurse applies dressing to puncture site.
   b. Performer coordinates with anesthesiologist (if present) and/or other staff members responsible for recovery and after-care of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room.
   c. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders additional examination.
   d. May check that spinal fluid sample has been prepared for laboratory, is properly identified, or decides to do personally. May present lab. order form to radiologist for signature.
   e. Performer records the examination according to institutional procedures. May include date, room, examination type, the views taken. For tomography may note the amplitude, speed, layer heights. Notes technical factors used and film sizes; may record the number of exposures made including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.
   f. Performer may record the fluoroscopic exposure including exposure time and rad dosage from posted data.
   g. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements.
   h. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or has this done, depending on institutional procedures.
   i. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

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1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected,set for fluoroscopy;scout films taken;radiologist assisted with puncture,catheterization;pt. and equipment positioned,set up for automatic injection,single or biplane serial filming,subtraction technique;filming coordinated with injection;radiographs sent for processing, radiologist's review;procedures repeated,continued as ordered;examination recorded;radiographs placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen;computer control panel,cable,keypunch cards;gowns, gloves,masks;technique,standard view,tube rating,rad exposure charts;phantom;x-ray generator(s),tube(s), control panel(s);extension cones;fluoroscopy unit,TV monitor,grid,image intensifier;cassettes;shielding; collimator(s);serial changer(s);tilt-table,radiolucent tabletop;R-L,ID device or markers;automatic injector;immobilization devices;pads;tape;ECG equipment;emergency cart;sterile procedure tray for puncture,catheterization;antiseptic,saline,anticoagulant, vasolidator,local anesthetic,iodine based contrast, disinfectant solutions;swabs;drape;syringes;stretcher;wheelchair;calipers

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.;radiologist;anesthesiologist;nurse;co-worker

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking spinal cord angiograms of any pt.,by reviewing request;measuring,reassuring pt.;setting up for fluoroscopy,serial filming (single or biplane),subtraction technique,automatic injection of contrast;making scout films;assisting with sterile puncture,catheterization procedure;identifying films;applying shielding;collimating;setting technical factors;positioning,immobilizing pt.;making serial films in coordination with injection;having films processed,reviewed; repeating,adjusting as ordered;placing radiographs for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card,and any appropriate medical-technical history for a patient scheduled for selective spinal cord angiography (radiographic contrast study of the blood vessels supplying the spinal cord, by selective introduction of contrast medium into arteries) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s) with record of technical factors used.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

    a. Performer checks the examination called for and the purpose. Notes whether request is for completion of a spinal cord study after one half of the vessels have already been visualized. Notes area of interest and side of interest for current study or whether bilateral opac-

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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ification is anticipated.

b. Notes name of radiologist in charge, names of other staff members to assist, examination room, time scheduled, and whether or when performer is to report for preliminary preparations.

c. Performer reads patient's name, identification number, sex, age, weight and height.

d. Notes whether hand or automatic injection, single or biplane seriography is to be used, type of serial film changer, whether sequence for serial radiography will be computer controlled (possibly combining film sequence with program for automatic injection of contrast). If so, notes whether program(s) have been selected for control panel. Notes whether subtraction technique may be ordered. Notes orders on sterile materials such as types and sizes of needles, catheters, guide wires, saline, antiseptic, anticoagulant anesthetic, vasoactive solutions, iodine based contrast. Notes whether ECG monitoring has been ordered.

e. Depending on institutional procedures, notes whether performer is to set up equipment and/or prepare patient personally, or whether performer will join neuroangiography team in examination room.

f. Notes whether patient has prior history of allergic reaction to contrast or history of allergies.

g. Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as respiratory or infectious condition, presence of IV drip, urinary catheter, behavioral disorder, incoherence. Notes whether patient will be arriving on stretcher, wheelchair, will be accompanied by nurse, other staff.

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h. Performer notes whether there are orders on prior preparation of patient such as therapeutic diet, allergy test, lab tests, cessation of oral contraceptive, prior abstinence from morning meal, cleansing enemas, emptying of bladder, start of IV drip, shaving of puncture site, prior administration of sedation, antihistamine or other medication.

   i) Notes appropriate timing and checks whether all procedures have been carried out and at appropriate time, and that all reports ordered are with patient's chart.

   ii) If there is any problem, arranges to have procedures carried out, examination postponed to allow proper timing, reports problem to appropriate staff member, or plans to inform radiologist.

i. Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus. Reports problem to appropriate staff member or plans to inform radiologist.

j. Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether history of extensive radiography should be reported to radiologist.

k. May check that the type of equipment ordered is available in ex-

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amination room assigned.

- i) Considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment and the area of interest.
- ii) Notes appropriate sterile procedures required, appropriate shielding for the examination. Notes whether film processing equipment is available adjacent to procedure room.
- iii) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.
- iv) If general anesthesia may be given, may check that x-ray equipment is compatible for use with anesthesia equipment.

l. If referring physician has requested that prior films, scans, and test results already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have these delivered.

m. If the performer determines that the request is not properly authorized, incomplete, or that sufficient information is lacking for performer to select technique or to properly position or immobilize patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

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2. Determines what prior preparations will be needed, such as cleaning and preparation of equipment and accessories, proper dress, consultation with procedure room staff, and rehearsal if so required. May carry out any or all of the following:

   a. Goes to appropriate room in the department for the type of examination involved and the equipment required, such as angiography suite or room assigned on requisition sheet. Checks that room is equipped with two serial film changers or a biplane unit.
   b. If appropriate, arrives for rehearsal of procedure and notes steps in relation to those of others on staff.
   c. May decide to clean x-ray equipment or arranges to have this done.

3. Prepares ahead so as not to keep patient in examination room longer than necessary:

   a. Washes hands as appropriate.
   b. Reviews the technique chart(s) for the unit(s) to be used (single or biplane serial changer(s), fluoroscopy unit).

      i) Locates information for the views likely to be required. Takes note of the exposure factors to be used for overheads and fluoroscopy. Considers preferences of the radiologist involved, conversions needed to account for patient's age, condition, area of interest, presence of contrast. Notes any newly posted changes in technical factors (to reflect accomodation to a change in machine output or a policy decision).

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ii) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.

iii) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

c. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator(s) and checks that each indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for machine to "warm up."

i) Makes sure that all circuits have been stabilized. If appropriate, checks each line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

ii) As appropriate, performer sets x-ray generator mode selector(s) to fluoroscopic mode, and/or for overhead filming as appropriate.

d. Sets up fluoroscopy equipment:

i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one

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is in examination room or control room.

ii) If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

iii) If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

iv) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position.

v) If a grid will be used with the image intensifier for fluoroscopy, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

vi) May adjust distance between focal spot and image intensifier (focal spot to film distance, FFD). May check that TOD is 15 inches or more.

vii) Performer may collimate fluoroscopy tube, depending on nature of the equipment and controls. May adjust fluoroscopy beam

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shutters to the field size anticipated for fluoroscopic examination or may set shutter mode selector to automatic collimation.

e. If not already done, checks fluoroscopy mode by operating controls in examination room behind leaded screen:

  i) Makes sure that no one is in room. Places phantom or appropriate test object on radiography table where patient's area of interest will be centered for examination.
  ii) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.
  iii) If not already done, moves image intensifier into position; centers (over or under) the area of interest.
  iv) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.
  v) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.
  vi) Checks mA meter and notes whether appropriate reading is obtained.
  vii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.
  viii) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

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  ix) After equipment has been checked, performer resets standard exposure factors. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

f. Performer may set up serial film changer(s) at a rate that is standard for procedure and await radiologist's further orders. May cycle each unit to check operation. If so, makes sure that anode is not rotating.

g. If automatic pressure injection equipment is or may be ordered, sets up and checks as appropriate to the type to be used; makes sure machine is grounded.

h. Performer may place single or biplane serial film changer(s) into position for the examination depending on the type of examination table to be used:

  i) May wheel see-through AP changer into position under catheterization table in preparation for scout film.
  ii) If conventional x-ray tilt-table will be used, places AP changer in convenient location near examination table and prepares for placement of patient on radiolucent table top for catheterization, after which patient will be moved to changer, or places changer to be wheeled under radiolucent table after fluoroscopy.
  iii) Performer may proceed with placement of vertical changer. May wheel vertical cassette changer (if not part of biplane set-up) beside table or AP changer, depending on equipment, in preparation for lat-

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eral filming with horizontal beam.

i. Checks that proper accessories are available for procedure:

  i) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure, and that appropriate shielding is available for placement between radiologist and the patient.
  ii) Checks that appropriate immobilization devices for area of interest and patient's age are present, and that there is radiolucent padding for comfort of patient. May arrange to have patient kept warm during procedure.
  iii) If orders have been given for the computer program(s) to be used (giving the number of films to be taken, per second intervals, number of separate series, and possibly a program to coordinate with automatic pressure injection), performer arranges to have keypunch control card(s) prepared (or delivered and checked), or decides to do personally. When orders have been given and control card is ready, performer places control card as appropriate in control panel of computer.
  iv) Checks that extension cones are available. May set up shoulder rests, hand holds, footboard on tilt-table.
  v) Makes sure that right (R) and left (L) markers are available for use and identification cards or leaded numerals or markers.
  vi) Checks that equipment or device is available to number serial films, or checks that cassettes such as vacuum cassettes are prenumbered and are in numerical

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order. May prepare identification strip using tape and lead numerals giving appropriate ID information for placement on table or scout film cassette(s). Checks identification against requisition sheet.
  vii) Performer makes sure that an adequate supply of loaded cassettes for rapid film changer (s) of the appropriate types and sizes are available in the examination room. Checks that these are loaded with appropriate speed and type of film and grid combinations depending on the area of interest, projections and techniques to be used, type of equipment, and institutional practices. If adequate supply is not in room, arranges to obtain or decides to obtain personally.

j. Performer notes whether ECG monitoring equipment (if ordered) and emergency cart is present. Notes who will be assigned to monitor.

k. May check that procedure tray for the examination has been properly prepared or decides to do personally:

  i) Depending on radiologist's orders, performer may check for appropriate types and sizes of puncture needles, tourniquets, catheters, syringes, scalpels, guide wires, forceps, dressings. Notes whether appropriate antiseptic, saline, anticoagulant, vasodilator and local anesthetic solutions are present. Checks for sterile drapes.
  ii) Checks that appropriate aqueous, iodine-based contrast solution is present. Checks that there is no evidence of chemical deterioration. May check

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that contrast solution is at appropriate temperature; may arrange to heat or cool.

4. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, any prior films, scans, and lab reports to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready:

   a. If performer is to prepare patient in procedure room, may proceed as follows:

      i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.

      ii) Performer has the patient brought from holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.

      iii) Performer greets patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet, referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

      iv) Has patient positioned or makes patient comfortable on examination table or on table-top over AP changer. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to table.
      If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.
      Performer may decide to assist patient to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.
      If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.
      May have nurse carefully place young patient in supine position on table, or lifts patient carefully, supporting patient's head, and places on table.

      v) Makes sure patient is being attended and there is no danger patient will fall off table.
      If patient has respiration, cardiac, infusion equipment or urinary catheter attached, makes sure that equipment is being monitored and is not dislodged.

      vi) If not already done, has patient's dentures, hair pins, spectacles, and any jewelry removed. Makes sure that all garments are removed, that patient is in gown; may check that patient is being kept warm.

      vii) If not already done, questions patient or accompanying adult about any prior preparations and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

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viii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

ix) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

x) Performer answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Attempts to develop a warm interaction. May hold child; may speak in calm, gentle voice Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning or degree of coherence. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

xi) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the body at the level(s) and in the direction(s) in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors. After measuring, has patient rest in as relaxed a position as possible.

b. When performer has measured the patient, may preset technical factors for scout film(s):

i) Performer selects the exposure factors for the preliminary scout projection as described, taking account of the measurements taken of the patient.

ii) At control panel(s) sets controls for radiography mode. Selects milliamperage and chooses selectors for the correct focal size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to prodice the desired kVp.

iii) Depending on the equipment, may set controls to provide for use of manual tableside adjustment of collimator, table and x-ray tube height and position (unless these have already been set).

iv) Performer obtains the appropriate size loaded cassette for the first scout projection and attaches identification information to the cassette.

Places right or left marker on cassette as appropriate to the study and projection or depresses appropriate R or L button for automatic marking.

Places identification information on appropriate corner of cassette or sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.

May place patient's card into card tray for equipment using automatic film marking device.

v) Performer may set serial changer(s) to allow for manual control and one scout exposure. With cassette changer may place one cassette in lateral film

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changer depending on the scout film(s) ordered. Performer may place a cassette (over or on changer), and/or place and support a cassette in front of the lateral changer in preparation for lateral scout film.

vi) Performer may set the focal-film distance(s) if not already done. Operates controls or manually moves the x-ray tube(s) into place. Checks each focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

c. Performer may inform attending radiologist when patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films and scans to radiologist. Displays radiographs on view boxes.

i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

ii) Performer may accompany radiologist to examination room, greet and/or introduce patient and staff members.

d. If not already done, performer joins radiologist, patient and other staff in examination room:

i) Performer may note radiologist's decision on whether to proceed and what will be done. Notes radiologist's orders for scout film(s), type of immobilization.

ii) Plans "plain film(s)" of the spinal column in the area of interest in standard position or as ordered. May plan for AP and lateral exposures, simultaneous or alternating exposures if biplane equipment is to be used.

iii) May provide gown, gloves, mask, lead apron and gloves to radiologist.

iv) Performer provides patient and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

5. Performer makes scout film(s) of patient as ordered:

a. Performer prepares patient for exposures:

i) Performer may have very young patient's body and extremities immobilized at sides by mummying (wrapping), or decides to do personally. If performer asks co-worker or nurse to do, indicates at what level sheet should be wrapped.

ii) May explain or demonstrate to staff member or patient what is required for immobilizing. May obtain help in positioning.

iii) Performer positions patient's body in supine position over or on AP serial changer. For lateral projection supports body on a radiolucent pad. Arranges body so that its median sagittal plane is centered to the midline.

iv) Supports any elevated parts. Has non-infant patient place arms in a comfortable position and supports ankles and knees.

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Arranges shoulders so that they lie on a single transverse plane. Centers film to part and keeps long axis parallel to film holder.

b. Performer may position as follows:

  i) For AP projection (posterior view) of cervical spine, performer places patient's arms down alongside body. Performer may tape arms to the body at the elbows after pulling them down. Elevates chin so that edges of upper incisors and mastoid tips lie on the same transverse plane. Performer may immobilize head with head clamp or webbing strap under chin. Centers cassette or film to the level of the fourth cervical vertebra. May direct central ray at right angles to midpoint of film, or at 10° cephalad, or as ordered.

  ii) For a lateral projection of cervical spine, performer adjusts a cassette in the vertical position at right angles to table on side of interest so that the lower portion is in contact with patient's shoulder. Centers to the fourth cervical vertebra and immobilizes patient.
  May place wedge shaped pads or radiolucent sponges beneath neck. May pull down patient's arms and tape to body as described above. Directs central beam horizontally at right angles to film.

  iii) For an AP projection (posterior view) of the thoraco-lumbar spine, performer maintains patient in supine position as described, with the long axis of x-ray tube parallel to the midline, and with the anode at the head (thoracic) end of the patient, and the cathode at the foot end. Centers film

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to the midpoint of the area of interest. Directs central ray at right angles to midpoint of film or as ordered. If the spine is not on a horizontal plane, directs central ray at right angles to its long axis, through the midpoint.

  iv) For a lateral projection of thoraco-lumbar spine, performer maintains patient in supine position. Places vertical cassette and supports so that x-ray beam may be directed horizontally at right angles to film. Centers cassette to the mid-axillary line of the body at the level of the center of area of interest. Directs central ray at right angles to mid-point of film.

c. Performer immobilizes patient as appropriate.

  i) Places restraining bands, sponges, sandbags, strips of gauze, and adhesive tape as needed. May use head clamp.

  ii) When positioning a patient with a balloon catheter in place, performer makes sure that the clamp is not lying over a part to be exposed or that patient is not lying on the clamp. Makes sure to avoid any actions that will separate catheter tubing from drainage bottle.

  iii) After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

  iv) Checks final positioning using light in collimator. Activates the collimator light and points the light beam towards the part.

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Uses cross-hair shadows as reference for center of field, and uses the collimator light to center the tube to the part.

v) Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust x-ray tube position lengthwise or crosswise to provide better centering.

d. Once the patient has been positioned and immobilized, performer adjusts the collimator so as to expose only the area of interest as defined by radiologist.

   i) May attach an auxilary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.

   ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

e. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.
Makes sure that anyone remaining in room is supplied with lead gloves and apron and stays out of central beam, especially horizontal beam.

f. Performer may rehearse coherent patient in holding breath and remaining motionless, or observes patient's breathing and plans exposure for the appropriate quiet phase such as after expiration.

g. Performer makes the exposure:

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   i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

   ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells patient when to hold breath, or observes patient's breathing and times exposure to the appropriate quiet phase required.

   iii) Performer initiates exposure by pressing hand trigger or exposure control button (or appropriate control for simultaneous or alternating biplane exposure).

   iv) While exposure is underway, performer may check that mA meter records appropriate current as set, that kVp meter dips slightly.

   v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.

   vi) After exposure is completed, tells patient that he or she can relax. Returns to patient. Removes the cassette(s) and any markers for further use.

h. If single plane scout films in both AP and lateral projections are ordered (and if biplane equipment was not used), performer maintains patient in same position; removes radiolucent sponge if lateral will be followed by AP projection, and proceeds with second exposure as described.

i. Performer arranges to have the scout film(s) processed at once or decides to do personally. Attaches

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ID card for use with flasher if appropriate. May sign requisition.

i) While film(s) are being processed, makes sure that patient is comfortable and attended by staff person or self.

ii) Performer brings the processed scout film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist when the radiograph(s) are ready.

6. During radiologist's review of requisition, scouts,prior films and examination of patient, performer notes radiologist's orders:

   a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.

   b. Performer notes whether radiologist requires a change in technical factors and/or centering, or central ray angulation for later serial filming.

      i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.

      ii) Notes whether any problem with technique is due to performer's own lack of attention,malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

   c. If radiologist will proceed, notes radiologist's final orders on sequence of examination, amount and type of contrast,sizes and types of materials, automatic or manual injection of contrast, program for serial filming, and injection site.

7. Performer carries out preparations for spinal angiography as ordered by radiologist based on the part of the work for which performer will be responsible. May carry out any or all of the following:

   a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray. May assist in preparation of catheters, puncture needle, syringes containing saline solution, local anesthetic, anticoagulant, contrast solution, vasodilator. Notes or checks amounts ordered.

   b. If performer will be responsible for filming, prepares ahead for use of fluoroscopy with surgical procedure, automatic or hand injection (including computer controlled), and serial filming:

      i) May reset technical factors for fluoroscopy and/or serial filming based on radiologist's review of scout film(s) and the presence of contrast for serial films.

      ii) Depending on equipment,performer may wheel serial changer(s) out of the way until fluoroscopy is completed; may make sure that everything is ready to lift patient from examination table on radiolucent table top to AP (or biplane) serial changer after instillation of contrast.

      iii) If not already done and required for equipment to be used, performer reviews with radiologist orders for sequence and timing

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of serial filming. Notes whether subtraction films are to be made. If so, makes sure that program or settings allow for plain films to be taken for each view, followed by injection and serial films; notes rate per second and intervals between sequences to allow for arterial, capillary and venous phases as required for angiography in a given area of interest.

iv) Sets programs for serial film changer(s), automatic injector as appropriate. Checks that planned exposure time does not exceed available capacity of unit. If not already done and computer program will be used, checks keypunch control card and places in computer control panel.

v) Performer may load cassette changer(s) with proper number of vacuum or other type of cassettes as ordered. (If appropriate, loads cut film changer or roll film changer.) If the same cassette changer will be used for lateral and AP projections, loads only enough cassettes for series in the first (lateral) projection to avoid artifact caused by shadow from last exposure in one position on the first cassette to be used in next position.
If biplane changers are to be used, performer notes whether the exposures will be simultaneous or alternating and loads changers as appropriate.
For computer controlled units, plugs synchronization cable from control unit into appropriate receptacle on the x-ray control panel.

vi) May set up equipment for automatic marking of films in numerical sequence or records cassette numbers for the sequence.

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vii) If automatic pressure injection is to be used, may attach tubing to syringe(s) with contrast using sterile technique. Attaches to machine and mounts syringe(s) as appropriate. Checks that there are no air bubbles. If appropriate, makes sure machine is on "stand-by."
If automatic injection is not computer controlled, sets flowrate dial for the cc's per second ordered by radiologist. When ordered by radiologist, sets pressure control as designated.

c. If performer is to assist with preparation of patient for catheterization, washes hands observing sterile technique when appropriate.

i) If not already done, may arrange to have puncture site shaved and prepared (right or left femoral artery).

ii) Abducts patient's legs and exposes the femoral artery on the side to be punctured below the inguinal ligament, as high as possible, but allowing for later compression proximal to puncture site.

iii) Immobilizes patient as appropriate. May place compression bands across patient's body; may use wrist restraints.

iv) May swab puncture site area with antiseptic solution and cover surrounding area with sterile towels.

v) If appropriate, may make sure that ECG monitoring leads have been applied, or decides to do personally.

d. If not already done, may provide radiologist with lead shielding, gloves; sterile gown, gloves,

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mask. Makes sure that patient and everyone to remain in room is properly shielded; may place lead screen in place if radiologist will inject contrast by hand.

e. If patient is to have general anesthesia, performer awaits signal that procedure can begin.

f. May receive or obtain a clean hospital gown, cotton "boots," cap and mask. Dons these before approaching sterile area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids touching patient, drapes, radiologist, nurse, or instrument table with nonsterile objects.

g. During injection of local anesthetic, puncture, placement of needle and advancing of catheter, performer assists as appropriate:

   i) May hand materials and supplies asked for using sterile technique.
   ii) May assist with fluoroscopic viewing of needle and progress of catheter placement. On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders.
   iii) Performer may operate tilt table on orders from radiologist, or assist in positioning patient as ordered.
   iv) Continues as ordered until radiologist is satisfied with needle and catheter placement; repeats as appropriate for alternative site. May assist with preparation and attachment of syringes to flush catheter or for injection of vasodilator, or injection of contrast solution

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for fluoroscopic check of catheter placement.
   v) Once catheter position is judged satisfactory, may tape into position, maintaining sterile field.

8. Performer coordinates serial filming with the radiologist when so ordered:

   a. Depending on equipment, performer rolls the AP changer into position under examination table, and/or positions vertical changer next to table; performer may assist while patient is moved (on radiolucent table-top) and centered on AP changer.

      i) Readjusts loaded changers for proper centering.
      ii) Performer sets up for lateral filming on the side of interest as described, or for simultaneous biplane lateral and AP filming. Collimates to the area of interest.

   b. Reviews with radiologist proper timing in relation to injection sequence for lateral and/or AP projections unless this is all to be done automatically. Allows for plain films to be taken before injection if subtraction films are ordered.
   c. On signal from radiologist, performer starts the automatic film changer or initiates the computer control of the injection and serial exposures at the control panel.
   d. Repeats for injection and filming of AP projections unless biplane equipment was used:

      i) If one single plane changer is being used, reloads changer with cassettes or adjusts roll or cut film transport for AP serial projections. Sets up for AP projection as described earlier.

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ii) Repeats coordination of injection and exposures.

e. Performer has the serial films processed at once or arranges to do personally.

  i) Makes sure that cassettes are numbered for appropriate order in sequence.
  ii) When the serial films have been processed, performer may place on view boxes with biplane AP and lateral views together and in appropriate serial order. Notifies radiologist when they are ready.

f. After processing, if radiologist indicates that subtraction prints are to be made, performer notes which post-injection radiographs (for each view) the radiologist wishes to utilize. Places the plain (pre-injection) film with the counterpart post-injection view(s) selected by radiologist.

  i) Makes out order for subtraction prints and takes to staff member who carries out this procedure. May present orders orally; may decide to prepare personally.
  ii) When subtraction prints are ready, performer places for viewing as described.
  iii) Repeats as appropriate if second order subtraction prints are ordered by radiologist.

g. Throughout procedure performer remains alert for any symptom of emergency or adverse reaction to contrast. As soon as performer judges that there is a reaction, performer notifies radiologist. May assist as appropriate with emergency

List Elements Fully

9. While radiologist reviews first series of spinal angiograms, performer notes decisions on how examination will proceed:

  a. Notes whether there will be a repeat of series with injection of additional contrast, change in technical factors, x-ray tube angulation, or injection pressure. If so, adjusts and repeats appropriate steps as described. Positions x-ray tubes for any oblique projections as ordered.
  b. Notes whether additional arteries will be opacified and proceeds as follows:

    i) Assists with fluoroscopic controls and positioning of table as radiologist advances catheter to each new location.
    ii) Repeats steps for injection and seriography as appropriate for each new location and projection.
    iii) May reset serial programs to obtain venograms when ordered.
    iv) If appropriate, repeats procedures as ordered for opposite side study.

  c. For each set of serial films performer resets technical exposure factors, pressure settings, etc., as required, and repeats appropriate steps for collimation, shielding, centering serial changer(s) and x-ray tube(s), setting angulation, making exposures, processing, and presenting for review, as described.

10. When informed by the radiologist that the radiographic examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

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List Elements Fully	List Elements Fully
a. May assist while radiologist removes connecting tubes, syringes, and catheter. b. May prepare to apply pressure to arterial puncture site when ordered. May prepare to apply pressure dressing to puncture site after manual pressure has been applied. c. Performer coordinates with anesthesiologist if present and/or other staff members responsible for recovery and after-care of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room. d. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders additional examination or delayed film, such as abdominal scout. e. Performer records the examination according to institutional procedures. May include date, room, examination type, the serial overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet. f. Performer may record the fluoroscopic exposure including exposure time and rad dosage from posted data. g. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements. Has reusable catheters flushed at once.	h. Performer may return accessories such as computer control cards and immobilization devices to appropriate locations or has this done. i. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. j. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

TASK DESCRIPTION SHEET

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This is page 1 of 21 for this task.

1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected and set for fluoroscopy;scout films taken;radiologist assisted with puncture,catheterization;pt. and equipment positioned or set up for automatic or hand injection, single or biplane serial filming (regular or large field) or conventional films;filming coordinated with compression and injection;radiographs sent for processing,radiologist's review;procedures repeated, continued as ordered;examination recorded;angiograms placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen; computer control panel,cable,keypunch cards;gowns, gloves,masks;technique,standard view,tube rating,rad exposure charts;phantom,test object;x-ray generator (s),tube(s),control panel(s);fluoroscope unit,TV monitor;shielding;collimator(s);serial changer(s);large field changer or tilt table;bucky or cassette tunnel; grids;image intensifier;cassettes;R-L,ID device or markers;automatic injector;immobilization devices; pads;tape;ECG equipment;emergency cart;sterile procedure tray for puncture,catheterization;antiseptic, saline,anticoagulant,vasodilator,nerve block,local anesthetic,iodine based contrast,disinfectant solutions;swabs,drape,syringes;stretcher;wheelchair; calipers;marking pen;weights;tourniquet

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. **If "Yes" to q. 3:** Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.;radiologist;anesthesiologist;nurse;co-worker

5. **Name the task** so that the answers to questions 1-4 are reflected.

Taking peripheral angiograms of any pt. (after percutaneous needle or catheter entry,translumbar puncture,ascending or descending venous entry),by reviewing request;measuring,reassuring pt.;setting up for fluoroscopy,conventional or serial filming (single or biplane),hand or automatic injection;making scout films;assisting with sterile puncture,catheterization;identifying films;shielding;collimating;setting technical factors;positioning,immobilizing pt.;making serial films of upper extremity or abdominal aorta,pelvis,lower extremity in coordination with injection;having films processed,reviewed;continuing,repeating,adjusting as ordered;assisting with termination;placing radiographs for use;recording exam.

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Performer receives or obtains the x-ray requisition form, patient's identification card,and any appropriate medical-technical history for a patient scheduled for peripheral angiography (contrast study of the arterial vessels of the upper or lower extremities by way of percutaneous needle, selective catheterization,or translumbar puncture of abdominal aorta, or contrast study of the veins of the legs via percutaneous needle injection) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s).

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for and the purpose:

      1) If peripheral arteriography has been ordered, notes whether upper or lower extremities are involved, whether study

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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will be unilateral or bilateral, and area of interest. Notes whether percutaneous needle or selective catheterization has been selected and the entry site. Notes if study is a continuation of a sequence of studies, and whether one side has already been visualed. Notes whether abdominal aorta and pelvic as well as peripheral arteries are to be visualized, whether hand(s) or feet are to be included.

ii) If translumbar abdominal aortography has been ordered, notes areas to be visualized, whether renal arteries are to be included. Notes entry site.

iii) If venography of the lower extremities has been ordered, notes whether bilateral study is requested, whether ascending or descending venography will be used, entry site, and areas to be visualized.

b. Notes name of radiologist in charge, names of other staff members to assist, examination room, time scheduled, and whether or when performer is to report for preliminary preparations.

c. Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is emergency patient.

d. Notes orders on equipment and materials:

i) Notes whether a large film angiographic serial changer with push rod and wedge filter will be used, conventional x-ray table with cassette tunnel, moving table, or other type of equipment for large area filming. Notes whether single or biplane unit is requested.

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ii) Notes sizes and types of puncture needles, sizes and types of guide wires, catheters if appropriate, type and amount of contrast solution.

iii) Notes whether contrast will be injected manually or by automatic pressure injection.

iv) Notes whether general and/or local anesthetic has been ordered.

v) If seriography has been ordered, notes whether program will be computer controlled to move table and/or cassettes, set film sequence and rate, and/or sequence and rate for automatic injection. Notes whether program(s) have been selected for control panel.

vi) Notes orders for use of tourniquets, vasodilator, weights, depending on type of examination.

vii) Notes orders for saline, antiseptic, anticoagulant, anesthetic solutions.

viii) Notes whether ECG monitoring has been ordered.

e. Depending on institutional procedures, notes whether performer is to set up equipment and/or prepare patient personally, or whether performer will join angiography team in examination room.

f. Notes whether patient has prior history of allergic reaction to contrast or history of allergies.

g. Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as respiratory or heart disease, communicable or infectious condition, presence of IV drip, urinary catheter. Notes whether patient will be arriving on stretcher, wheelchair, will be

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accompanied by nurse, other staff, will be incoherent, sedated.

h. Performer notes whether there are orders on prior preparation of patient such as shaving of entry site, therapeutic diet, allergy test, lab tests, cessation of oral contraceptive, prior abstinence from morning meal, cleansing enema, start of IV drip, prior administration of sedative, tranquilizer, antihistamine or other medication.

   i) Notes appropriate timing for medication to take effect. Checks whether all procedures have been carried out and at appropriate time, and that all reports are with patient's chart.
   ii) If there is any problem, arranges to have procedures carried out, examination postponed to allow proper timing, reports problem to appropriate staff member, or plans to inform radiologist.

i. Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus. Reports problem to appropriate staff member or plans to inform radiologist.

j. Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether history of extensive radiography should be reported to radiologist.

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k. May check that the type of equipment ordered is available in examination room assigned.

l. Performer considers the accessory equipment, technical factors, shielding, and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment, the examination ordered, and the areas of interest.

   i) Notes appropriate sterile procedures required, appropriate shielding for the examination. Notes special filters needed if not part of equipment. Notes whether film processing equipment is available adjacent to procedure room.
   ii) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.
   iii) If general anesthesia may be given, may check that x-ray equipment is compatible for use with anesthesia equipment.

m. If referring physician has requested that prior films, scans and test results already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have these delivered.

n. If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or immobilize patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies su-

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pervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

2. Performer determines what prior preparations will be needed, such as cleaning and preparation of equipment and accessories, proper dress, consultation with procedure room staff and rehearsal if so required. May carry out any or all of the following:

   a. Goes to appropriate room in the department for the type of examination involved and the equipment required, such as angiography suite, or room assigned on requisition sheet.
   b. Checks that room is supplied with the type of equipment ordered.
   c. If appropriate, arrives for rehearsal of procedure and notes steps in relation to those of others on staff.
   d. May decide to clean x-ray equipment or arranges to have this done.

3. Prepares ahead so as not to keep patient in examination room longer than necessary:

   a. Washes hands as appropriate.
   b. Reviews the technique chart(s) for the unit(s) to be used (single or biplane serial changer or conventional x-ray unit, and fluoroscopy unit).

      i) Locates information for the areas of interest and the views likely to be required. Takes note of the exposure factors to be used for overheads and fluoroscopy. Considers preference of the radiologist involved, conversions

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needed to account for patient's age, condition, area of interest, presence of contrast. Notes any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

      ii) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factors. Multiplies, divides, adds, or subtracts as appropriate.
      iii) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

   c. Performer makes sure that x-ray equipment is ready for use.

      i) Goes to control panel(s) for x-ray generator(s) and checks that each indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for machine to "warm up."
      ii) Makes sure that all circuits have been stabilized. If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

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d. Sets up fluoroscopy equipment:

i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room. Sets x-ray generator mode selector for fluoroscopy.

ii) If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

iii) If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

iv) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position.

v) If a grid will be used with the image intensifier for fluoroscopy, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

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vi) May adjust distance between focal spot and image intensifier (focal spot to film distance, FFD). May check that TCD is 15 inches or more.

vii) Performer may collimate fluoroscopy tube depending on nature of the equipment and controls. May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or may set shutter mode selector to automatic collimation.

e. If not already done, checks fluoroscopy mode. Operates controls in examination room behind leaded screen or in control room:

i) Makes sure that no one is in room. Places phantom or appropriate test object on radiography table where patient will be centered for examination.

ii) Adjusts fluoroscopic tube stand so that tube is at zero degrees and centered to the area of interest.

iii) If not already done, moves image intensifier into position;centers to the area of interest.

iv) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.

v) Performer adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.

vi) Checks mA meter and notes whether appropriate reading is obtained.

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vii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.

viii) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

ix) After equipment has been checked, performer resets standard exposure factors. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

f. Performer may check or prepare special equipment:

i) If single or biplane serial changer(s) will be used, may cycle each unit to check operation. If so, makes sure that anode is not rotating.

ii) Depending on the equipment, performer may place a wedge filter in the primary beam so that the beam is attenuated towards the patient's feet. Places in tube aperture so that graduation in thickness runs the long axis of table and is thicker at the foot end.

iii) Depending on the equipment, may check functioning of push rod or programmed movement of x-ray tube and/or examination table. May put cassette tunnel in place on table.

iv) Performer may set up and check automatic pressure injection equipment as appropriate to the type to be used (if any). Makes sure it is grounded.

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g. Checks that proper accessories are available for procedure:

i) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure, that appropriate shielding is available for placement between radiologist and the patient.

ii) Checks that appropriate immobilization devices for patient's age and type of examination are present, and that there is radiolucent padding for comfort of patient. May check for stool for placement of patient's lower leg in erect position for ascending venography. May check for tourniquets, weights.

iii) If orders have been given for the computer program(s) to be used (giving the number of films to be taken, per second intervals, number of separate series, and possibly a program to coordinate tube or table travel, automatic pressure injection and/or technical factors), performer arranges to have computer control card prepared (or delivered and checked), or decides to do personally. When orders have been given and control card is ready, performer places control card as appropriate in control panel of computer.

iv) Makes sure that right (R) and left (L) markers are available for use and identification cards or leaded numerals or markers.

v) For serial filming checks that equipment or device is available to number serial films,

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or checks that cassettes such as vacuum cassettes are prenumbered and are in numerical order.

- vi) May obtain lead numerals and tape and prepare identification strip giving appropriate patient identification information for placement on table or film holders. May prepare for use of flashcard by checking that there is piece of lead on film holder surface. May write or type out ID information on card if not received with requisition. May place card as appropriate for use with automatic marking device.

h. Depending on whether equipment calls for use of roll film, conventional cassettes, or cassettes to be used in rapid film changer, performer checks that there is adequate film available for the examination:

- i) For roll film changer, checks that sufficient film is available in changer and properly loaded.
- ii) For cassette changer or conventional filming makes sure that there is an adequate supply of loaded cassettes of the appropriate sizes for the areas of interest and type of equipment to be used, such as extra large cassettes for large field angiography.
- iii) If the film sequence will employ various combinations of intensifying screens, numbers of screens, film speeds, and grids to achieve uniform density, performer checks that each cassette is loaded with the appropriate speed and type of film, number of screens, and grid combinations as appropriate, and that cassettes are in proper order for filming, depending on the projections and techniques to be used, type of equipment, and institutional practices.
- iv) If adequate supply is not in room, arranges to obtain or decides to obtain personally.

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i. Performer notes whether ECG monitoring equipment (if ordered) and emergency cart is present. Notes who will be assigned to monitor.

j. May check that procedure tray for the examination has been properly prepared or decides to do personally.

- i) Depending on radiologist's decisions, checks for appropriate types and sizes of puncture needles, catheters, syringes, scalpels, guide wires, forceps, dressings. Notes whether appropriate antiseptic, saline, anticoagulant, vasoactive and local anesthetic solutions are present.
- ii) Checks that appropriate aqueous iodine based contrast solution is present. Checks that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool.

k. Depending on the x-ray equipment that will be used, performer may roll serial changer(s) into position for AP and/or lateral projections in preparation for scout film, may move bucky tray out of way until after fluoroscopic examination is completed, or otherwise prepares equipment for ready access so that there will be little delay

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in using equipment during actual procedure.

4. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, and prior films, scans and lab reports to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready:

   a. If performer is to prepare patient in procedure room, may proceed as follows:

      i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.
      ii) Performer has the patient brought from holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room.
      iii) Greets coherent patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.
      iv) Makes patient comfortable on examination table or on table top over changer. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be

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lifted with patient on it from wheeled base to table.
If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.
Performer may decide to assist patient to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.
If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.

      v) Makes sure patient is being attended and there is no danger patient will fall off table. If patient has respiration, cardiac or infusion equipment or urinary catheter attached, makes sure that equipment is being monitored. Has patient rest in as relaxed a position as possible. May place radiolucent pad under bony prominences.
      vi) Checks that patient's garments and jewelry are removed and that patient is in gown. May make sure that patient is being kept warm.
      vii) If not already done, questions patient or accompanying staff about any prior preparations and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).
      viii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

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ix) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

x) Performer answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Attempts to develop a warm interaction. Speaks to patient in calm, gentle voice. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning or degree of coherence. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

xi) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the abdomen, pelvis and/or extremities at the level(s) and in the direction(s) in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining final exposure factors. May note whether obesity must be considered in selecting factors. After measuring, has patient rest in as relaxed a position as possible.

b. Performer may inform attending radiologist when patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films or scans to radiologist. Displays radiographs on view boxes.

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i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

ii) Performer may accompany radiologist to examination room, greet and/or introduce patient and staff members.

c. If not already done, performer joins radiologist, patient and other staff in examination room.

i) Performer may note radiologist's decision on whether to proceed and what will be done.

ii) Notes radiologist's orders for scout film(s) type of immobilization, areas of interest, patient position(s) and projections. If biplane scouts are requested, notes whether alternating or simultaneous exposures are required.

iii) May provide hospital gown, mask, to radiologist. Provides with lead apron and gloves.

iv) Performer provides patient and anyone who will remain in room during exposures with appropriate protective shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general

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precaution to minimize unnecessary radiation exposure.

5. After making sure that patient is being attended, performer sets up equipment for the scout films before positioning and immobilizing patient:

   a. Performer may place serial changer (s) in position for single or biplane scout film(s).

      i) Depending on type of examination, the scout films ordered, standard institutional procedures, or radiologist's orders, performer may set changer(s) for manual control so that only one scout exposure can be made. May place cassette(s) in appropriate position on table, in vertical cassette holder, or in front of or on top of changer before loading changer for serial filming.
      ii) For catheter or percutaneous needle peripheral arteriography and translumbar abdominal aortography, plans to place cassettes in tunnel, bucky or in changer for recumbent frontal exposure of abdomen, pelvis, upper or lower extremities as ordered, and right angle lateral projections for biplane filming.
      iii) For lower extremity ascending venography, plans to place cassette in vertical cassette holder, or in (or in front of) vertical changer for erect lower leg filming.
      iv) For lower extremity descending venography, sets up for horizontal placement of patient, with cassette placed horizontally where leg will be placed.

   b. Performer selects and sets the exposure factors for the scout projection(s) for each unit:

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      i) Performer selects the exposure factors for the preliminary scout projection(s) as described, taking account of the measurements taken of the patient.
      ii) At control panel(s) sets controls for radiography mode.
      iii) For conventional exposure control, performer selects milliamperage and chooses selectors for the correct focal spot size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.
      iv) For automatic phototimed exposure control with conventional filming, selects and sets the category corresponding to the type of study and use or nonuse of screens, bucky, etc., and, if appropriate, focal spot size. Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming).
      May select and set a kVp range button (if called for with the equipment) corresponding to the range for examination.
      Sets a density selector corresponding to the usual (or special) requirements of the study.
      Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.
      v) Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustment of table and tube height, position, and collima-

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tor (unless these have already been set).

vi) May return to each x-ray tube and set the focal-film distance (if not already done). Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

c. Performer attaches identification information to the cassette(s) or table top:

i) Places right or left marker on film holder or table top as appropriate to the study and projection, or depresses appropriate R or L button for automatic marking. May tape lead markers to patient's body.

ii) If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.

iii) If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.

iv) Performer may place patient's card into card tray for equipment using automatic film marking device.

v) Depending on equipment and film size, performer places cassette (s) in film tunnel on table, in bucky, in (or on) serial changer; and/or moves film changer into horizontal position for lateral and frontal projections of the upper extremity, for frontal

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projections of the abdomen, pelvis, and lower extremities (except for ascending venography).

vi) Places cassette(s) in vertical film holder or vertical changer for lateral views of the abdomen, pelvis, lower extremities, and for both AP and lateral views of the lower leg with ascending venography.

6. Performer positions patient and takes scout exposure(s) ordered:

a. May obtain help in positioning and immobilizing patient. May explain to staff member what is required.

b. Makes sure that correct side and part is being positioned. Centers the part keeping the long axis of the part parallel to the film holder. Centers patient to midline and film to the level of the area of interest. With upright film, adjusts height of holder to part and centers part to film.

c. For AP, PA or lateral projections with patient recumbent, performer centers the supine or prone patient so that the median sagittal plane of the body is centered to the midline. Adjusts patient's shoulders to lie on a single transverse plane. Performer positions and centers cassette(s) or film in changer under patient; centers to the area of interest depending on whether one or more than one cassette is to be used, cassette size, and area(s) of interest to be included on a single cassette. May elevate patient on radiolucent pads to make possible supine or prone positioning for lateral views.

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d. For projections of the arteries of the upper extremity, makes sure to position for the side of interest. Places patient in supine position on table with the arm of interest abducted, and placed over the film so that the area of interest is centered.

i) For a lateral view of the upper arm, forearm and hand, flexes patient's elbow 45° or 90° in the direction of the head. Rotates wrist 90° from supine position. Extends patient's fingers and thumbs so that ulnar side of wrist is facing film holder. Checks that metacarpals and phalanges are superimposed. Uses sponges or blocks to support on either side. Checks that the radius, ulna and carpal bones are in lateral superimposition. Uses plastic panel and sandbags to hold in place.

ii) For AP projection (posterior view) of upper arm, forearm and hand, extends patient's arm as much as possible with hand palm up (supinated). Checks that the anterior surface of the elbow is parallel to the plane of the film, and that the medial and lateral epicondyles of the humerus are parallel to the film holder. Immobilizes by placing translucent panel across humerus, arm, and hand. Secures with sandbags.

iii) Centers film to area of interest. Directs central ray at right angles to film, entering at the center of area of interest.

e. For projections of the arteries of the abdomen, abdominal aorta, pelvic area, and/or angiography of the lower extremities, (except for

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ascending venography of lower leg and translumbar puncture), performer aligns patient in supine position.

i) Centers the median sagittal plane of body to the midline of table and/or film. Includes ankle(s) and feet if so ordered in area of interest.

ii) Extends both legs so that feet are together with toes pointing up. May turn feet out if so ordered. Arranges so that the long axes of femora are parallel with plane of film.

iii) Positions young patient's arms by extending them over head along sides of ears and wrapping or taping, or has older patient abduct arms, flex elbows, and place hands well above the abdominal area. May apply tape, towel, stretch gauze.

iv) May check that there is no rotation of pelvis by measuring the distance from the anterior superior iliac spine to table top on each side. Overcomes rotation of pelvis due to swelling or atrophy by elevating appropriate side.

v) For AP projection(s) (posterior view(s)), centers cassette to the center of the area of interest depending on orders and/or the size of cassette. Directs central ray at right angles to midpoint of film.

vi) For lateral projection(s) notes side of interest and positions vertical changer or vertical cassette in holder at right angles to table. Centers at the level of the area of interest at the mid-axillary line of the body. Directs central ray horizontally at right angles to midpoint of film.

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f. For projections of the arteries of the abdomen, abdominal aorta, pelvic area, and/or lower extremities via translumbar puncture, performer positions patient in prone position.

   i) Centers the median sagittal plane of body to the midline of table and/or film. Supports thorax and feet. Cushions and rests head on forehead or cheek. Checks that there is no pelvic rotation.
   ii) Positions and immobilizes hands by extending arms comfortably over head or flexing elbows as described above.
   iii) May rotate feet internally and support toes.
   iv) For PA projection (anterior view) centers film and directs central ray as described for AP projection.
   v) Sets up for lateral projections by positioning film in vertical holder and directing central ray horizontally to midpoint of film as described above.

g. For projections of the lower leg for ascending venography, has patient sit on table or stool with the sole of the foot (on side of interest) resting flat on a stool.

   i) For AP or PA projection, places vertical changer or cassette holder directly behind and in contact with lower leg, or directly in front and in contact with lower leg. Centers to include the knee and/or foot if so ordered.
   ii) For lateral projection, places vertical changer or cassette holder at right angles to frontal plane and in contact with side of leg.

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   iii) Directs central ray horizontally at right angles to midpoint of film.

h. For AP and/or PA projections including large areas such as abdomen, pelvis and lower extremities, performer keeps the long axis of the central ray parallel with the long axis of the body, with the anode toward the foot end of the patient and the cathode toward the abdominal end.

i. Performer immobilizes patient as appropriate:

   i) If not already done, may use plastic panel held in place by sandbags for extremities. May use restraining bands, tape across table, sponges, strips of gauze, adhesive tape, head clamp.
   ii) When positioning a patient with a balloon catheter or IV drip in place, performer makes sure that no radiopaque part is lying over a part to be exposed or that patient is not lying on catheter clamp. Makes sure to avoid any actions that will separate catheter tubing from drainage bottle or dislodge IV needle.
   iii) After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.
   iv) Checks final positioning using light in collimator. Activates the collimator light and points the light beam towards the part. Uses cross-hairs shadows as reference for center of field, and uses the collimator light to center the tube to the part.

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- v) Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust x-ray tube position lengthwise or crosswise to provide better centering.

j. Once the patient has been positioned and immobilized, performer adjusts the collimator so as to expose only the area of interest as defined by radiologist.

- i) Adjusts primary beam to minimum size needed to cover the area of interest.
- ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

k. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.
Makes sure that anyone remaining in room is supplied with lead gloves and apron and stays out of central beam.

l. Performer may rehearse coherent patient in holding still, or breathing out and holding breath, or observes patient's breathing and plans exposure for the appropriate quiet phase such as after expiration.

m. Performer makes first (or next) scout exposure:

- i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted. Returns to control panel and checks that controls are properly set and patient is still in position.
- ii) As rehearsed, tells patient when to hold still or to breathe out and hold, by calling or using intercom; or observes patient's breathing and times exposure to the appropriate quiet phase required.
- iii) Performer initiates exposure by pressing hand trigger or exposure control button (or appropriate control for simultaneous or alternating biplane exposures).
- iv) While exposure is underway, performer may check that mA meter records appropriate current as set, that kVp meter dips slightly.
- v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
- vi) With phototimer, notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cutoff, or overexposure due to faulty timer).
- vii) After exposure is completed, tells patient and any staff member that he or she can relax.
- viii) Returns to patient. Removes (each) cassette from holder, changer, bucky or film tunnel. Removes any markers for further use.

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n. Performer repeats radiography steps for all preliminary exposures ordered before review by radiologist, adjusting technical factors, tube, and position of patient or film holder as appropriate for each view ordered.

  i) Except for upper extremity study, if single plane scout films in both AP and lateral projections are ordered (and if biplane equipment was not used), performer maintains patient in same position; sets up for right angle filming and proceeds with second exposure as described. If appropriate for upper extremity study, repositions for lateral or AP projection.
  ii) If scouts of further area(s) of interest are ordered beyond those centered in first scout, performer recenters film and central ray as appropriate for other areas of interest.

o. Performer arranges to have the scout film(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

  i) While film(s) are being processed, makes sure that patient is comfortable and attended by staff person or self.
  ii) Performer brings the processed scout film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist when the radiograph(s) are ready. May place prior films for viewing as well.

7. During radiologist's review of scouts,

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performer notes the radiologist's final orders:

a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.
b. Performer notes whether radiologist requires a change in technical factors, centering, or central ray angulation for later conventional or serial filming.

  i) May discuss technical factors in relation to need for uniform density.
  ii) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.
  iii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

c. If radiologist will proceed, notes radiologist's final orders on sequence of examination, site of puncture, use of general anesthesia, additional medication, types and sizes of materials, amount of contrast, type of filming, program for filming, type of injection, any adjustment in film, grid, screen combinations or size.

  i) May note whether radiologist will employ fractional filling and sequential filming, the number of series anticipated.

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ii) Notes orders for use of tourniquets or vasoactive drug and timing.

iii) Notes whether needle and catheter placement will be checked with fluoroscopy or overhead film.

8. Performer carries out preparations for angiography as ordered by radiologist based on the part of the work for which performer will be responsible. May carry out any or all of the following:

   a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray. May assist in preparation of catheters, puncture needle, syringes containing saline solution, local anesthetic, anticoagulant, contrast solution, vasodilator. Notes or checks amounts ordered.

   b. If performer will be responsible for filming, prepares ahead for use of fluoroscopy with surgical procedure, use of overhead film to check needle placement (if ordered), automatic or hand injection (especially if computer controlled), and conventional or serial filming:

      i) May reset technical factors for fluoroscopy and conventional or serial filming based on radiologist's review of scout film(s) and the presence of contrast in postinjection films.

      ii) If overhead of needle and/or catheter position will be needed during surgical procedure, performer prepares cassette(s) with ID information as appropriate.

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May plan to use Polaroid cassette and processing equipment.

iii) If not already done and required for equipment to be used, performer reviews with radiologist orders for sequence and timing of serial filming. Notes orders for timing of movement of table and/or cassettes or film, automatic injector (if to be used), rate per second and intervals between sequences to allow for arterial, capillary and venous phases as required for arteriography and/or venography.

iv) If biplane changers are to be used, performer notes whether the exposures will be simultaneous or alternating. Loads changers as appropriate.

v) If appropriate, loads cut film changer or roll film changer. May load cassette changer(s) with proper number of vacuum or other type of cassettes as ordered. If the same cassette changer will be used for lateral and AP projections, loads only enough cassettes for series in the first projection to avoid artifact caused by shadow from last exposure in one position on the first cassette to be used in the next projection.

vi) Sets programs for serial changer(s), automatic injector as appropriate. Checks that planned exposure time does not exceed available capacity of unit. If not already done and computer program will be used, checks computer control card and places in computer control panel.

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vii) With computer controlled units, plugs synchronization cable from control unit into appropriate receptacle on the x-ray control panel.

viii) May set up equipment for automatic marking of films in numerical sequence or records cassette numbers for the sequence.

ix) If automatic pressure injection is to be used, may attach tubing to syringe containing contrast using sterile technique. Attaches to machine and mounts syringe as appropriate. Checks that there are no air bubbles. If appropriate, makes sure machine is on "stand-by."

If automatic injection is not computer controlled, sets flow-rate dial for the cc's per second as ordered by radiologist.

Sets pressure control as and when designated by radiologist.

x) Depending on equipment, performer may wheel vertical film holder or changer out of the way until fluoroscopy is completed.

c. If performer is to assist with preparation of patient for puncture and catheterization, washes hands observing sterile technique when appropriate. If not already done, may arrange to have puncture site shaved and prepared. May position patient for access to puncture site as follows:

i) For femoral artery puncture, abducts supine patient's legs and exposes the femoral artery on the side to be punctured below the inguinal ligament as high as possible, but allowing for later compression proximal to puncture site.

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ii) For axillary artery puncture, has supine patient abduct arm on side to be punctured with arm bent. Provides access to area below clavicle or at axilla as ordered.

iii) For subclavian artery puncture, has supine patient extend head slightly. Turns head away from the side to be punctured and provides access to root of neck or below the clavicle as ordered.

iv) For femoral vein puncture (for descending venography), positions as for femoral artery and provides access to the femoral vein at the level of the oval fossa of the thigh.

v) For translumbar puncture, has patient lie in prone position with feet turned out. Provides access to the lumbar site selected such as at the level of the left twelfth rib.

vi) For ascending venography, has patient seated as for scout film, unless otherwise ordered. Provides access to selected vein in foot to be punctured such as dorsal vein of great toe.

vii) Performer may immobilize as appropriate. May place compression bands across patient's body; may use wrist restraints.

viii) For ascending venography, if deep crural veins are to be visualized, may assist with application of tourniquet around ankle above the malleoli.

ix) For femoral arterial injection, may assist with application of tourniquet(s) proximal to the arterial pressure on both legs, or opposite side to be injected, as ordered.

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x) May swab puncture site area with antiseptic solution and cover surrounding area with sterile towels.

xi) If appropriate, may check that ECG monitoring leads have been applied, or decides to do personally.

d. If not already done, provides radiologist with lead shielding, gloves, sterile gown, gloves, mask. Makes sure that patient and everyone to remain in room is properly shielded; may place lead screen in place if radiologist will inject contrast by hand.

e. If patient is to have general anesthesia, performer awaits signal that procedure can begin.

f. May receive or obtain a clean hospital gown, cotton "boots," cap and mask. Dons these before approaching sterile area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids touching patient, drapes, radiologist, nurse, or instrument table with nonsterile object.

g. During injection of local anesthetic, puncture, placement of needle, advancing of catheter, performer assists as appropriate:

i) May hand materials and supplies asked for using sterile technique.

ii) May assist with fluoroscopic viewing of needle and/or progress of catheter placement. On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders.

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iii) Performer may operate tilt table on orders from radiologist, or assist in positioning patient as ordered.

iv) For overhead check of needle placement, performer places cassette as indicated by radiologist. Sets technical factors as appropriate for location as for plain films. Collimates to area of interest and makes exposure. Has film processed at once or decides to do personally. Places for radiologist to view.

v) Continues as ordered until radiologist is satisfied with needle or catheter placement.

vi) May assist with preparation and attachment of syringes to flush catheter or inject vasodilator. Assists with attachment of syringes with contrast solution for fluoroscopic check of catheter placement.

vii) Repeats as appropriate for alternative site. Once catheter position is judged satisfactory, performer may tape into position, maintaining sterile field.

h. When radiologist decides on pressure for automatic injection of contrast (if used), performer sets the pressure control as ordered.

9. Performer coordinates conventional serial filming with the radiologist when so ordered:

a. Depending on equipment, performer rolls the single or biplane changer(s) into position if necessary for first postinjection series, or places cassette(s) in bucky or cassette tunnel.

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i) Readjusts for proper centering tube-film-object alignment for projections as appropriate and as described above.

ii) Checks that serial changer is locked and ready.

iii) For peripheral catheter arteriography, sets up for AP projection or AP and lateral biplane projections as appropriate; sets up for successive injections and exposures of abdominal aorta, pelvic, thigh and distal runoff vessels unless large size films are being used. Positions as described. Checks sequence of events, including when to remove tourniquet(s).

iv) For translumbar route, sets up for PA or PA and lateral biplane projections as appropriate, and proceeds as for peripheral catheter arteriography.

v) For descending lower extremity venography, sets up for AP or AP and lateral projections. Checks sequence including when patient is to be encouraged to strain as though moving bowels (Valsalva maneuver).

vi) For ascending lower leg venography, sets up patient with lower leg erect as described. Checks sequence of events including when to remove tourniquet to demonstrate deep crural veins.

vii) Performer collimates to the area of interest and checks shielding.

b. On signal(s) from radiologist, performer coordinates for injection, exposure and acceleration of blood flow.

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i) If and when ordered, performer removes tourniquet(s) or encourages patient to strain as rehearsed.

ii) Depending on equipment and orders from radiologist, performer starts the serial changer, coordinates the serial filming with hand injection or automatic injection by radiologist. May initiate programmed control of injection, serial exposures, and movement of table as ordered.

c. If additional injections have been planned and not already programmed, performer continues and repeats as planned and when ordered. If right angle views are required and biplane equipment is not being used, and if not already done, loads changer, positions equipment for lateral filming after frontal projections as described. Sets technical factors and repeats appropriate steps.

d. Performer has the exposed films processed at once or decides to do personally:

i) Makes sure that serial films are numbered for appropriate order in sequence.

ii) When the serial films have been processed, performer may place on view boxes with biplane frontal and lateral views together and in appropriate serial order. Notifies radiologist when they are ready.

e. While radiologist reviews first series of angiograms, performer notes decisions on how examination will continue:

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i) For peripheral arteriography, notes whether radiologist will inject additional contrast and continue filming, repeat exposures with a change in technique, or will carry out alternative entry such as direct needle puncture, bilateral study, or placement of catheter or needle in distal vessel. Performer repeats appropriate steps as described, including assistance with surgical procedures, fluoroscopy and filming.

ii) For translumbar route, carries out orders and repeats appropriate steps for additional injections, filming, changes in technique.

iii) For descending lower extremity venography, performer carries out second stage filming of external and common iliac veins as ordered (without straining by patient), as described.

iv) For ascending lower leg venography, carries out second stage filming of lower leg valves and muscle veins as ordered by setting up for frontal and lateral views. May assist with placement of weights to load patient's knee. May encourage patient to raise and lower heel several times just prior to filming.

v) If bilateral study is involved, repeats as appropriate for other side.

vi) If oblique views are ordered, performer directs central ray at appropriate angle to area of interest or supports recumbent patient so that area of interest is at appropriate angle in relation to the film.

vii) Notes orders for a change in amount of contrast, change in pressure settings for automatic injection, and/or the rate and speed for serial filming. Adjusts equipment as appropriate. Makes any changes in x-ray tube position, angulation and/or position of serial changer and/or position of patient as appropriate.

viii) For each set of films, performer resets technical exposure factors, pressure settings, etc., as required and repeats appropriate steps for collimation, shielding, centering film and/or changers. Repeats exposures, processing and presenting for review as described.

ix) May note radiologist's decision to continue procedure at another time and arranges to reschedule.

x) Throughout procedure performer remains alert for any symptom of emergency or adverse reaction to contrast. As soon as performer judges that there is a reaction, performer notifies radiologist at once. May assist with emergency care as ordered.

10. When informed by the radiologist that the radiographic examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

a. May assist while radiologist removes connecting tubes, syringes, needles and/or catheter(s).

b. May prepare to apply pressure to venous or arterial puncture site when ordered. May prepare to apply pressure dressing to puncture site after manual pressure has been applied. Removes any markers from patient's body.

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c. Performer coordinates with anesthesiologist if present and/or other staff members responsible for recovery and after-care of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room.

d. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders additional or later examination, abdominal scout film, or other tests or medication.

e. Performer records the examination according to institutional procedures. May include date, room, examination type, the serial or overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.

f. Performer may record the fluoroscopic exposure including exposure time and rad dosage from posted data.

g. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements. Makes sure that any nondisposable guide wires and catheters are cleaned and flushed immediately following use and before sterilization.

h. Performer may return accessories such as computer control cards and immobilization devices to appropriate locations or has this done.

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i. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures.

j. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

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This is page 1 of 25 for this task.

1. **What is the output of this task? (Be sure this is broad enough to be repeatable.)**

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected,set for fluoroscopy;scout films taken;radiologist assisted with puncture,catheterization;pt. and equipment positioned,set up for automatic injection,single or biplane serial filming,magnification,subtraction,spotfilming,videotaping;filming coordinated with injection;films sent for processing,radiologist's review;procedures repeated,continued as ordered;examination recorded;angiograms placed for use.

2. **What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)**

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen;computer control panel,cable,keypunch cards;gowns,gloves,masks;technique,standard view,tube rating,rad exposure charts;phantom;x-ray generator(s),tube(s),control panel(s),extension cones;fluoroscopy unit,TV monitor,grid,image intensifier;cassettes;shielding;collimator(s);serial changer(s);tilt-table,radiolucent table-top;spotfilm device,roll film;videotape device;stereo viewer;R-L,ID device or markers;automatic injector;immobilization devices;tape;ECG equipment;emergency cart;sterile procedure tray for puncture,catheterization;antiseptic,saline,anticoagulant,vasolidator,vasoconstrictor,local anesthetic,iodine based contrast,disinfectant solutions;swabs,drape,syringes;stretcher;wheelchair;calipers

3. **Is there a recipient, respondent or co-worker involved in the task?** Yes...(X) No...( )

4. **If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.**

Any pt.;radiologist;anesthesiologist;nurse;co-worker

5. **Name the task so that the answers to questions 1-4 are reflected.**

Taking catheter thoracic and/or abdominal aortograms of any pt.,and/or selective visceral arteriograms (bronchial or abdominal),by reviewing request;measuring,reassuring pt.;setting up for fluoroscopy,serial filming (single or biplane),subtraction,magnification,spotfilming,stereography,videotaping,manual or automatic injection;making scout films;assisting with sterile puncture,catheterization,vasoactive drugs;identifying films;applying shielding;collimating;setting technical factors;positioning,immobilizing pt.;making serial films in coordination with injection;having films processed,reviewed;continuing as ordered;placing angiograms for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a patient scheduled for catheter aortography (contrast study of thoracic and/or abdominal aorta by means of percutaneous catheterization) and/or related selective visceral arteriography (selective catheterization of branches of the descending aorta such as bronchial arteries, renal, celiac, hepatic, adrenal, superior and/or inferior mesenteric, or retroperitoneal arteries) as a result of:

- a. Regular assignment.
- b. Checking assignment on schedule sheet.
- c. Having arranged requisitions in order of priority.
- d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s).

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

    a. Performer checks the examination called for, the purpose and the areas involved:

OK-RP;RR;RR

6. **Check here if this is a master sheet..(X)**

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i) Notes whether aortography will precede selective visceral arteriography; notes the specific (selective) areas of interest, whether bilateral catheterization and/or visualization will be involved, and, if so, whether simultaneous or sequential catheterization will be done.

ii) Notes suggested puncture site(s), catheter route(s) and injection site(s).

b. Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is emergency patient.

c. Notes name of radiologist in charge, names of other staff members to assist, examination room, time scheduled, and whether or when performer is to report for preliminary preparations.

d. Performer notes the types of techniques and equipment that must be prepared depending on area of interest, institution's available equipment, standard procedures and radiologist's specific orders:

i) Notes type of serial film changer ordered, whether cassette, roll film, cut film, whether single or biplane, whether computer controlled, whether equipped with "see-through" top. Notes type of table, whether angiography table, normal tilt-table or rotating table. Notes whether patient will be moved from angiography table to changer, whether changer will be rolled under or beside table, or whether, with see-through changer, horizontal changer will be kept in place under table throughout procedure.

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ii) Notes whether spotfilming, stereo-filming, videotaping have been or may be ordered, whether magnification or subtraction techniques are to be used.

iii) Notes whether Valsalva maneuver will be used, whether general anesthesia has been suggested.

iv) Notes type of iodine based contrast solution ordered, whether automatic or hand injection will be used and equipment selected.

v) Notes orders on types, sizes and lengths of catheters, whether J-shaped, preformed, closed or open ended, with side holes, whether radiopaque, whether with deflector assembly. Notes orders on type of safety guide wires, types and sizes of needles.

vi) Notes orders on vasodilator, vasoconstrictor, local anesthetic, anticoagulant, antiseptic, saline solutions.

e. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment and the area of interest.

i) May check that the type of equipment ordered is available in examination room assigned.

ii) Notes appropriate sterile procedures required, appropriate shielding for the examination. Notes whether film processing equipment is available adjacent to procedure room.

iii) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress

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for the equipment and room to be used.

- iv) If general anesthesia may be given, may check that x-ray equipment is compatible for use with anesthesia equipment.
- v) Notes whether ECG and vital sign monitoring equipment has been ordered, whether transfusions may be carried out.

f. Performer notes relevant information about the patient's history and orders for prior preparation:

- i) Notes whether patient has prior history of allergic reaction to contrast or history of allergies. Notes whether allergy test has been ordered and, if so, results.
- ii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.
- iii) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether history of extensive radiography should be reported to radiologist.
- iv) Notes how patient will arrive for examination (whether patient will arrive in wheelchair, on stretcher, accompanied by staff, whether patient will be coherent, whether sedated).
- v) Notes any special information on patient's condition that could

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affect positioning, immobilization, handling, or selection of technique, such as respiratory or heart disease, communicable or infectious condition, presence of IV drip, urinary catheter, behavioral disorder, incoherence. If patient is to be examined for gastrointestinal bleeding, notes that patient may be in shock.

- vi) Performer notes whether there are orders on prior preparation of patient such as therapeutic diet, allergy test, lab tests, cessation of oral contraceptive, prior abstinence from morning meal, cleansing enemas, catheterizing of bladder, start of IV drip, prior administration of sedation, tranquilizer, antihistamine, other medication, shaving of puncture site (s). Notes appropriate timing for medications to take effect.
- vii) Checks whether all procedures have been carried out and at appropriate time and that all reports ordered are with patient's chart. If there is any problem, arranges to have procedures carried out, examination postponed to allow proper timing, reports problem to appropriate staff member, or plans to inform radiologist.

g. Depending on institutional procedures, notes whether performer is to set up equipment and/or prepare patient personally, or whether performer will join angiography team in examination room.

h. If referring physician has requested that prior films, scans and test results already on file be sent with current radiographs, and if not already with patient's

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jacketed material, performer arranges to have these delivered.

i. If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to prepare properly, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

2. Performer prepares ahead so as not to keep patient in examination room longer than necessary. Determines what prior preparations will be needed, such as cleaning and preparation of equipment and accessories, proper dress, consultation with procedure room staff and rehearsal if so required. May carry out any or all of the following:

   a. Goes to appropriate room in the department for the type of examination involved and the equipment required, such as angiography suite or room assigned on requisition sheet. Checks that room is equipped with the type of machines ordered and appropriate tilt or rotating examination table:

      i) If magnification has been requested, performer may check that the machine to be used has a fractional focal spot of appropriate size for direct magnification technique (i.e. 0.3 mm or smaller), and can operate with rapid changer and/or fluoroscopy. Checks that table and/or tube heights can be adjusted as needed.

      ii) May decide to clean x-ray equipment or arranges to have this done.

      iii) If appropriate, arrives for rehearsal of procedure and notes steps in relation to those of others on staff.

      iv) Washes hands as and when appropriate.

   b. Reviews the technique chart(s) for the unit(s) to be used (single or biplane serial changer(s), fluoroscopy and spotfilm unit).

      i) Locates information for the views likely to be required. Takes note of the exposure factors to be used for overheads, spotfilms and fluoroscopy for the areas of interest. Considers preferences of the radiologist involved, conversions needed to account for patient's age, condition, presence of contrast. Notes any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

      ii) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.

      iii) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of

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the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

c. Checks for appropriate film supplies:

  i) If serial changer(s) call for roll film, performer checks that there is an adequate supply loaded in changer(s) for the needs of the examination, and that the film is properly loaded.

  ii) If serial cassette changer(s) will be used, or cassette for scouts and/or stereography, performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Performer checks that these are loaded with appropriate speed and type of film and grid combinations depending on the patient's size, area of interest, techniques to be used, type of equipment, and institutional practices. If adequate supply is not in room, arranges to obtain or decides to obtain personally.

  iii) Checks that equipment or device is available to number serial films, or checks that cassettes such as vacuum cassettes are prenumbered and are in numerical order.
  May prepare identification strip using tape and lead numerals giving appropriate ID information for placement on table or regular cassette(s).
  May prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write out ID information on card if not received with requisition. Checks identification against requisition sheet. May place card as appropriate for use with automatic marking device.

  iv) Makes sure that right (R) and left (L) markers are available for use.

  v) If examination may include spotfilming using a camera (attached to image intensifier) and roll film, performer checks film supply indicator to make sure that there is sufficient film in the roll film cassette. If there is insufficient roll film in camera, performer arranges to have roll film cassette loaded or decides to do personally.
  When loaded roll film cassette is obtained, checks loading in subdued light.
  Checks that end of film is cut correctly and is properly threaded and attached to takeup spool so that film unwinds appropriately. Checks that film is properly engaged in sprockets. Locks into operating position. If appropriate, cuts off excess film at exit port and removes. Attaches film cassette to camera and locks into place. Replaces camera cover.
  If there is an adequate film supply, checks that film is properly loaded. Advances film to compensate for any exposure of film due to installation or check. Removes dark slide from camera lens.

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If not already done, performer writes or types a card with patient's identification information for use with spotfilm device. Inserts in slot in spotfilm camera as appropriate.

vi) If examination may include spotfilming using a cassette/bucky spotfilm device, performer checks that there is an adequate supply of appropriate size cassettes in room. If there is insufficient supply of cassettes, arranges to obtain or decides to obtain personally.
Carries out identification of the spotfilm cassettes as for other cassettes.
Performer may use controls or manually pull out spotfilm bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Moves cassette into appropriate "stored" position.

vii) If R-L markers are to be used with spotfilming, performer tapes into place on image intensifier screen or plans to tape to patient's body.

viii) If appropriate, makes sure that there is sufficient tape available for videotape device.

d. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator(s) and checks that each indicator light shows that machine(s) is(are) "warmed up," or turns on main switch as appropriate to equipment and allows time for machine(s) to "warm up."
Makes sure that all circuits have been stabilized. If appropriate, checks each line voltage meter and, if needed, turns compensator dials until needle is aligned properly on line meter.

e. Performer sets up and checks fluoroscopy equipment:

i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.

ii) Sets x-ray generator mode selector to fluoroscopic mode.

iii) If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

iv) If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

v) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position.

vi) If a grid will be used with the image intensifier for fluoroscopy, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid

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lines parallel to the long axis of the tube.

vii) May adjust distance between focal spot and image intensifier (focal spot to film distance, FFD). May check that TOD is 15 inches or more.

viii) Performer may collimate fluoroscopy tube depending on nature of the equipment and controls. May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or may set shutter mode selector to automatic collimation.

ix) To check fluoroscopy mode if not already done, performer places phantom or appropriate test object on radiography table where patient's area of interest will be centered for examination. Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest. If not already done, moves image intensifier into position; centers (over or under) the area of interest. Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor. Adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly. Checks mA meter and notes whether appropriate reading is obtained. Checks that TV brightness controls are operating and adjusts for preliminary viewing. Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

f. Performer sets up and checks spotfilm equipment:

i) If appropriate sets mode selector for spotfilm use (camera or cassette device).

ii) Performer sets controls on image intensifier for spotfilm camera or cassette device. For spotfilm camera, performer selects and sets the rate (frames per second) for the camera according to standards set for examination. For cassette spotfilming performer may select and set a standard spotfilm program providing for format combinations such as single, half, or quarter combinations on a single cassette and related spotfilm sizes. Selects program appropriate for examination or awaits orders from radiologist.

iii) If appropriate, performer selects and sets exposure factors for spotfilming. For conventional manual exposure control, performer selects and sets the appropriate spotfilm time for the examination. For automatic, phototimed exposure control, performer selects a density exposure control appropriate for the examination. Performer selects the appropriate mA for the examination and

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the focal spot size to be used. Performer selects and sets kVp by combining settings on one major and one minor kVp selector as appropriate for the examination.

iv) If not already done, moves image intensifier and any spotfilm device into position; centers to the area of interest.

v) May collimate x-ray tube used for spotfilming as appropriate. Manually sets collimator for the spotfilm field size to be used, or selects and sets field size control to be used for automatic collimation with programmed spotfilm cassette exposure sequence.

vi) To check spotfilm functioning, performer may move cassette or roll film into x-ray exposure field using appropriate controls. May activate controls for spotfilm exposure. Notes whether cassette or roll film transport is operating appropriately. Notes whether exposure is terminated by phototimer or, if manual timer, in time set. If appropriate, releases spotfilm control after exposure. If equipment is operating appropriately, performer unloads cassette and reloads or advances roll film as appropriate. Moves bucky into appropriate stored position.

g. If examination will include use of videotape, performer sets up magnetic tape cassette or video disc scanner for recording of image directly from the television monitor. Prepares and checks replay mechanism. Sets controls at record position.

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h. Performer may set up and check serial changer(s) as appropriate to equipment:

i) As appropriate, sets x-ray mode selector(s) for overhead filming.

ii) If orders have been given for the computer program(s) to be used (giving the number of films to be taken, per second intervals, number of separate series, and possibly a program to coordinate with automatic pressure injection), performer arranges to have keypunch control card prepared, or delivered and checked, or decides to do personally. When orders have been given and control card is ready, performer places control card as appropriate in control panel of computer.

iii) Depending on the type of film changer and examination table to be used (rotating or tilt), and on whether single or biplane serial filming will be done, performer may wheel see-through horizontal changer into position under angiography table, may place changer so that patient may be moved to changer on radiolucent top after catheterization, or may place changer so that it may be placed under table after fluoroscopy. With biplane equipment sets up vertical changer as appropriate for lateral filming at right angles to horizontal changer. If appropriate, first positions equipment for anticipated scout films.

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iv) Performer may set serial film rate that is standard for procedure and await radiologist's further orders. May cycle each unit to check operation. If so, makes sure that anode is not rotating.

i. Performer may set up and check automatic pressure injection equipment as appropriate to the type to be used (if any); makes sure it is grounded.

j. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

k. Performer notes whether ECG and vital sign monitoring equipment (if ordered) and emergency cart are present. Notes who will be assigned to monitor.

l. May check that procedure tray for the examination has been properly prepared or decides to do personally.

  i) Depending on radiologist's orders, performer may check for appropriate types and sizes of puncture needles, tourniquets, catheters, syringes, scalpels, guide wires, forceps, dressings. Notes whether appropriate antiseptic, saline, anticoagulant, vasodilator, vasoconstrictor, and local anesthetic solutions are present.

  ii) Checks that appropriate aqueous iodine based contrast solution is present. Checks that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool.

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m. Checks that proper accessories are available for procedure:

  i) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure, that appropriate shielding is available for placement between radiologist and the patient.

  ii) Checks that appropriate immobilization devices for adult or child and type of procedure are present.

  iii) Checks that extension cones are available.

  iv) Checks for hospital gowns, masks, gloves to be worn for sterile procedure. May check for emesis basin and towels.

  v) May set up footboard, shoulder rests, hand holds on tilt table.

3. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, any prior films, scans, and lab reports to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready:

  a. If performer is to prepare patient in procedure room, may proceed as follows:

    i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.

    ii) Performer has the patient brought from the holding area

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and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room (wheeled on stretcher if patient has been sedated; escorted or carried if child or adult patient is to have general anesthesia after entering department).

iii) Performer greets a coherent patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet, referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

iv) Has patient positioned or makes patient comfortable on examination table or on table-top over AP changer. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to table.
If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.
Performer may decide to assist patient to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.
If assisting patient to step on footstool in order to get on table, helps patient turn into

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position, step backwards on stool, and then sit and/or lie on table.
May have nurse carefully place young patient in supine position on table, or lifts patient carefully, supporting patient's head, and places on table.

v) Makes sure patient is being attended and there is no danger patient will fall off table.
If patient has respiration, cardiac or infusion equipment, or urinary catheter attached, makes sure that equipment is being monitored and is not dislodged.

vi) Checks that patient is in gown, with all jewelry removed; may check that patient is being kept warm.

vii) Performer may stand by or assist with measures to treat patient for shock if appropriate, as ordered.

viii) If not already done, may question patient or accompanying staff member about any prior preparations and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

ix) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

x) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge

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at once; proceeds only with approval.

xi) Answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning or degree of coherence. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

xii) Notes the patient's body type, whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points will be easy to find. For thoracic aortography or bronchial arteriography may note whether adult female patient's breasts are large and pendulous. If so, may have staff member draw the breasts to the sides and hold in place with wide bandage.

xiii) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the body at the level(s) and in the direction(s) in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors. After measuring, has patient rest in as relaxed a position as possible.

b. Performer may inform attending radiologist when patient is ready to

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be examined. May bring requisition sheet, patient's medical history, chart, and any prior films and scans to radiologist. Displays radiographs on view boxes.

i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

ii) Performer may accompany radiologist to examination room, greet and/or introduce patient and staff members.

c. If not already done, performer joins radiologist, patient and other staff in examination room.

d. During radiologist's review of requisition, prior radiographic materials, and examination of patient, performer notes radiologist's orders:

i) If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.

ii) Notes radiologist's orders for scout film(s), type of immobilization, area(s) of interest and projection(s). If biplane scouts are requested, notes whether alternating or simultaneous exposures are requested. Notes puncture site(s) selected.

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iii) Provides radiologist with gown, gloves, mask, lead apron and gloves. Provides patient and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

iv) For thoracic aortography and bronchial arteriography, performer may plan scout film(s) of chest and abdomen.
For abdominal aortography and abdominal viscera, performer may plan scout film(s) of the abdomen. May plan to include the distal esophagus for arterial portography, suspected gastrointestinal bleeding as appropriate or if ordered.

4. Performer makes preliminary scout film(s) as ordered after making sure that patient is being attended. Sets up equipment for the examination before positioning and immobilizing patient:

   a. Performer may place single or biplane changer(s) in position for AP and/or lateral projection(s) of the area of interest:

      i) May set changer(s) for manual control so that only one scout exposure will be made. If so, loads changer with appropriate cassette or operates film transport.

      ii) May select appropriate size cassette(s) and place in appropriate position(s) on table or in vertical cassette holder.

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      iii) Performer attaches appropriate identification information. May place right or left marker on cassette as appropriate to the study and projection or depresses appropriate R or L button for automatic marking. May tape lead markers to patient's body. May place identification information on appropriate corner of cassette; may set flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
      May place patient's card into card tray for equipment using automatic film marking device.

   b. Performer sets technical factors for the scout film(s). Sets up for AP and lateral projections if biplane equipment will be used, or first scout projection ordered.

      i) Performer selects the exposure factors for the preliminary scout projection(s) as described, taking account of the measurements taken of the patient.

      ii) Sets each control panel for radiography mode, and, as or if appropriate, for simultaneous or alternating exposures for biplane equipment.

      iii) For each projection selects milliamperage and chooses selectors for the correct focal size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

      iv) Depending on the equipment, may set controls to provide for manual tableside adjustment of col-

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limator, table and x-ray tube height and position (unless these have already been set).

v) Performer may set the focal-film distance(s) if not already done. Operates controls or manually moves the x-ray tube(s) into place. Checks each focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

c. Performer prepares patient for final positioning:

i) Performer prepares patient on table over changer in supine position. Plans for horizontal beam exposure for any lateral projection. May place radiolucent support under patient for lateral projection.

ii) For lateral projection makes sure that vertical changer or cassette is on the side of interest at right angles to table.

iii) Depending on patient's age and condition, performer may obtain help in positioning and immobilizing patient. May explain to staff member what is required.

iv) With very young patient performer may immobilize patient's arms by extending them and placing them along sides of head, next to the ears. May apply a sleeve made of a diaper, towel, pillowcase or orthopedic stockinet to hold arms so that sleeve holds arms above and behind head, one at each side. May apply a sleeve of stretch gauze or bandage to the pelvis. Wraps lightly to maintain patient in position.

v) When positioning a patient with a balloon catheter or IV drip

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in place, performer makes sure that no radiopaque part is lying over an area to be exposed, or that patient is not lying on a clamp. Makes sure to avoid any actions that will separate catheter tubing from drainage bottle or dislodge IV needle. Remains alert to patient's respiration. Does not force patient into a position where any breathing difficulty increases. Does not force flexion of the neck.

vi) Arranges patient's body so that median sagittal plane is centered to the midline. Arranges shoulders so that they lie on a single transverse plane. Centers film to part and keeps long axis parallel to film holder.

d. If distal esophagus is to be included in scout projection(s), performer may position as follows:

i) Performer positions patient in supine position as described. Gently extends head and neck. May place wedge shaped pads or radiolucent sponges beneath neck; checks that head is in true AP position and immobilizes head. Depresses shoulders as much as possible.

ii) Centers film to include the entire area of interest. For a separate view of the upper end of the esophagus, centers to film at the level of the laryngeal prominence. For entire esophagus centers to the 5th or 6th thoracic vertebra.

iii) For a lateral projection directs the central ray horizontally at right angles to the

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mid-axillary line of the body at the level of the center of area of interest.

iv) For an AP projection directs central ray vertically at right angles to the midpoint of the area of interest.

e. For projection(s) of the thoracic aorta and viscera, positions patient in supine position as described above:

i) Performer may pronate patient's hands at the level of the hips and elevate elbows so as to draw scapulae outwards, or has patient's hands immobilized over head as described above. May elevate thorax. May elevate patient's knees and place restraining band across legs.

ii) May center film to the sternal angle, midsternum, 4th or 6th thoracic vertebra, depending on the area of interest.

iii) Directs central ray horizontally for lateral projection and vertically for AP projection, directed to the midpoint of the area of interest, at right angles to the film.

f. For projection(s) of the abdominal aorta and viscera, performer centers patient in supine AP position.

i) With very young patient has patient's arms immobilized above and behind head next to ears as described; has lower legs immobilized as described, or tapes legs together just above knees; may turn head to one side. Gently extends head and neck and immobilizes with head clamp, webbing strap under chin, or

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sponges so that median sagittal plane of head is at right angles or parallel to the film. May elevate patient's knees and place restraining band across legs.

ii) With older patient elevates patient's shoulders and knees so that patient's back is in contact with table. Supports. Adjusts shoulders and hips so that they lie on single transverse planes. May immobilize ankles. Has patient flex elbows and abduct arms.

iii) Performer centers film just above the iliac crests unless otherwise specified. Makes sure not to use visual points of muscle or fatty tissue and palpates for the crest of the bone.

iv) Directs central ray horizontally for lateral projection and vertically for AP projection, directed to the midpoint of the area of interest, at right angles to the film.

g. If not yet completed, performer immobilizes patient in position.

i) Places restraining bands, strips of gauze, and adhesive tape as needed. May use head clamp. Avoids use of compression band across abdomen or chest.

ii) May check that there is no rotation of pelvis by measuring the distance from the anterior superior iliac spine to table top on each side. Overcomes rotation of pelvis due to swelling or atrophy by elevating appropriate side.

iii) After patient has been immobilized, performer makes sure

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that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

iv) Checks final positioning using light in collimator. Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows as reference for center of field, and uses the collimator light to center the tube to the part.

v) Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube to provide better centering.

h. Once the patient has been positioned and immobilized, performer adjusts the collimator so as to expose only the area of interest as defined by radiologist.

i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.

ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

i. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.
Makes sure that anyone remaining in room is supplied with lead gloves and apron and stays out of

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central beam, especially horizontal beam.

j. Performer may rehearse coherent patient in breathing out and holding or breathing in and holding, depending on area of interest and orders, or observes patient's breathing and plans exposure for the appropriate quiet phase such as after expiration.

k. Performer makes the exposure:

i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells patient when to breathe as rehearsed and hold breath, or observes patient's breathing and times exposure to the appropriate quiet phase required.

iii) Performer initiates exposure by pressing hand trigger or exposure control button (or appropriate control for simultaneous or alternating biplane exposure).

iv) While exposure is underway, may check that mA meter records appropriate current as set, that kVp meter dips slightly.

v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.

vi) After exposure is completed, tells patient that he or she can relax. Returns to patient.

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Removes the cassette(s) and any markers for further use.

l. If single plane scout films in both AP and lateral projections are ordered (and if biplane equipment was not used), performer maintains patient in same position; removes radiolucent sponge if lateral will be followed by AP projection; and proceeds with second exposure as described.

m. Performer arranges to have the scout film(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

  i) While film(s) are being processed, makes sure that patient is comfortable and attended by staff person or self.
  ii) Performer brings the processed scout film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist when the radiograph(s) are ready. May place prior films for viewing as well.

5. During radiologist's review of the scout films and prior films, performer notes radiologist's orders on what will be done:

a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.

b. If radiologist decides that additional preparatory steps are needed, performer may arrange to have these carried out and/or performer arranges to reschedule patient.

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c. Performer notes whether radiologist requires a change in technical factors and/or patient positioning, centering, or central ray angulation for later serial filming.

  i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.
  ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

d. If radiologist will proceed, notes radiologist's final orders on sequence of examination and use of contrast and equipment:

  i) Notes site of puncture, whether general anesthesia will be used, additional medication, types and sizes of materials, type and amount of contrast.
  ii) Notes final orders on use of automatic injection, use of biplane or single plane serial filming, serial stereography, spotfilming, magnification, videotape, use of vasoactive drugs. With biplane study notes desired angulation, whether exposures will be simultaneous or alternating.
  iii) Notes program for serial filming, elapse of time, rate of exposures, number of sequences, whether to allow for arterial, capillary and venous phases, pre-injection films for subtraction masks; notes degree

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of magnification ordered, angle between tubes and direction of shift for stereography; notes program for cassette spotfilming.

iv) Discusses sequence and timing of procedure with radiologist. May arrange signals for serial exposure, changing of spotfilm cassettes, operation of fluoroscopy controls.

6. Performer carries out preparations for angiography as ordered by radiologist based on the part of the work for which performer will be responsible. May carry out any or all of the following:

   a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray. May assist in preparation of catheters, puncture needle, syringes containing saline solution, vasodilator, vasoconstrictor. Notes or checks amounts ordered. Checks contrast for signs of chemical deterioration.

   b. If performer will be responsible for filming, prepares ahead for fluoroscopy, spotfilming, automatic or hand injection (including computer controlled), and serial filming:

      i) May reset technical factors for fluoroscopy, spotfilms and/or serial filming based on radiologist's review of scout film(s) and the presence of contrast.
      ii) If appropriate, changes or adjusts program for spotfilming.
      iii) With bronchial arteriography, may set up for videotaping from TV image during fluoroscopy.

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      iv) Sets programs for serial film changer(s), automatic injector as appropriate.
      If subtraction films are ordered, makes sure that program or settings allow for plain films to be taken for each view, followed by injection and serial films. Sets rate per second and intervals between sequences to allow for arterial, capillary and venous phases as required for angiography of a given area of interest. Checks that planned exposure time does not exceed available capacity of unit.
      v) If not already done and computer program will be used, checks keypunch control card and places in computer control panel. Plugs synchronization cable from control unit into appropriate receptacle on the x-ray control panel.
      vi) Performer may load cassette changer(s) with proper number of vacuum or other type of cassettes as ordered. Loads cut film or roll film changer(s) as appropriate. If the same cassette changer will be used for lateral and AP projections, loads only enough cassettes for series in the first serial projection to avoid artifact caused by shadow from last exposure in the first projection on the first cassette to be used in the next projection. If biplane changers are to be used, loads changers as appropriate for simultaneous or alternating exposures.
      vii) Depending on equipment, performer may wheel serial changer(s)

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out of the way until fluoroscopy is completed; may make sure that everything is ready to lift patient from examination table on radiolucent table top to horizontal (or biplane) serial changer after fluoroscopy.

viii) May set up equipment for automatic marking of films in numerical sequence or records cassette numbers for the sequence.

ix) If automatic pressure injection is to be used, may attach tubing to syringe(s) containing the contrast solution using sterile technique. Attaches to machine and mounts syringe(s) as appropriate. Checks that there are no air bubbles. If appropriate makes sure machine is on "stand-by."

x) If automatic injection is not computer controlled, sets flow-rate dial for the cc's per second ordered by radiologist. When ordered by radiologist, sets pressure control as designated.

c. For magnification technique with serial filming, removes grid from changer and sets up as follows:

i) Determines the degree of magnification requested. If the request is expressed as an area magnification, performer determines the linear magnification by taking the square root. (Linear magnification squared equals area magnification.)

ii) Performer adjusts the height of the horizontal table or changer top and/or x-ray tube so that the ratio of the focal-film distance (FFD) to the focal-object distance (FOD), i.e., FFD divided by FOD, is equal to the desired degree of magnification. For a two-times linear magnification performer simply sets the FOD equal to the OFD (object-film distance).

iii) Performer adjusts the collimation to correspond to the field size anticipated for the FOD involved.

iv) For magnification technique using a vertical cassette changer, adjusts upright holder to appropriate height; adjusts x-ray tube to right-angle horizontal projection of beam to film; centers to the film; measures and adjusts FOD to expected patient position; measures and adjusts OFD from patient position.

v) If the sum of the new FOD and OFD (FFD) is now different from the FFD used for non-magnification technique, performer may consult technique chart to note the factor to use for a compensatory change in mAs. May also note the change in kVp and mAs necessary to compensate for any change in collimation from non-magnification technique. Consults appropriate chart for conversion factors. May record. Performer resets technical factors as appropriate.

d. If performer is to assist with preparation of patient for catheterization, washes hands observing sterile technique when appropriate.

i) If not already done, may arrange to have puncture site(s) shaved and prepared (right and/or left femoral or axillary

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artery). Has patient lie in supine position.

ii) Positions patient for access to puncture site.
For femoral artery puncture, abducts patient's legs and exposes the femoral artery on the side to be punctured below the inguinal ligament,as high as possible, but allowing for later compression proximal to puncture site.
For axillary artery puncture,has patient abduct arm on side to be punctured with arm bent. Provides access to area below clavicle or axilla as ordered.

iii) Immobilizes patient as appropriate. May adjust shoulder supports; may use wrist restraints.

iv) May swab puncture site area with antiseptic solution and cover surrounding area with sterile towels.

v) If appropriate, may make sure that ECG monitoring leads have been applied, or decides to do personally.

vi) Informs radiologist when patient and materials are ready.

e. If not already done, provides radiologist with lead shielding and gloves. May provide sterile gown, gloves, mask. Makes sure that patient and everyone to remain in room is properly shielded; may put lead screen in place if radiologist will inject contrast by hand.

f. If patient is to have general anesthesia, performer awaits signal that procedure can begin.

g. May receive or obtain a clean hospital gown, cotton "boots," cap and mask. Dons these before approaching sterile area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids

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touching patient, drapes, radiologist, nurse, or instrument table with non-sterile object.

h. During injection of local anesthetic, puncture, placement of needle and advancing of catheter, performer assists as appropriate:

i) May hand materials and supplies asked for using sterile technique.

ii) May assist with fluoroscopic viewing of needle and progress of catheter placement. On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Continues to adjust kVp and/or mA controls according to radiologist's orders.

iii) Performer may operate tilt table on orders from radiologist, or assists in positioning patient as ordered. Continues as ordered.

iv) May assist with attachment of syringes to flush catheter, inject vasoactive drug,anesthetic, or inject contrast solution for fluoroscopic check of catheter placement.

v) Once catheter position is judged satisfactory, may tape into position,maintaining sterile field.

vi) Repeats as appropriate for alternative site or bilateral catheterization.

7. When the radiologist has advanced the catheter to the appropriate first location for serial or videotape filming, performer coordinates with the radiologist when so ordered:

a. May assist in positioning patient on table or over changer:

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i) May assist in moving patient on table top to horizontal changer.
ii) May roll horizontal and/or biplane changer(s) into position under and/or beside angiography table.

b. Positions patient or assists radiologist in positioning:

i) If abdominal aortography will be done first (such as prior to thoracic aortography or selective abdominal visceral arteriography), performer positions patient for a supine AP projection of the abdomen and pelvis, or for AP and lateral biplane projections, as described.
ii) For thoracic aortography performer may help position patient in supine or prone position depending on whether videotaping from a fluoroscopic image or serial filming will be done. Helps position and support patient for a right and/or left posterior oblique projection at 40° to 60° as ordered, or adjusts motorized table to the required degree of rotation. Performer may position for single or biplane frontal and/or lateral projection(s) if so ordered.

c. Performer checks that serial changer(s) are loaded, locked and ready. Centers and adjusts the x-ray tube (s) angulation as appropriate. Centers film in changer(s) to the specified area of interest as described, and collimates to the smallest possible exposure area. Checks patient's shielding.
d. For automatic serial stereo-filming, centers x-ray tubes in position for frontal or lateral shift at the desired angle. Sets controls for automatic alternating of exposures.

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e. Depending on whether injection is by hand or automatic, manually initiated or computer controlled, performer starts the automatic film changer(s) on signal of the radiologist, or initiates the computer control of the injection and serial exposures at the control panel on signal from radiologist.
f. With fluoroscopy and videotaping, performer may operate tilt-table or fluoroscopic controls as ordered, as described above.
g. If additional injections and exposures are required, such as right angle or opposite side oblique projections, and if biplane equipment has not been used, performer centers equipment as appropriate.

i) Resets technical factors for the projections involved if required, repeats collimation, shielding, and coordination of injection and making exposures as described.
ii) If one single-plane changer is being used, reloads changer with cassettes or adjusts roll or cut film transport for additional serial projections. Sets up as described earlier.

h. Performer has the serial films processed at once or decides to do personally.

i) Makes sure that serial films are numbered with appropriate order in sequence.

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  - ii) When the serial films have been processed, performer may place on view boxes in appropriate serial order. Puts biplane views together. May provide stereo viewer. Notifies radiologist when aortograms are ready.

- i. After processing, if radiologist indicates that subtraction prints are to be made, performer notes which post-injection radiographs (for each view) the radiologist wishes to utilize. Places the plain (pre-injection) film with the counterpart post-injection view(s) selected by radiologist.
  - i) Makes out order for subtraction prints and takes to staff member who carries out this procedure. May present orders orally; may decide to prepare personally.
  - ii) When subtraction prints are ready, performer places for viewing as described.
  - iii) Repeats as appropriate if second order subtraction prints are ordered by radiologist.

- j. Performer may operate the replay mechanism of videotape attachment if so ordered. May "freeze" a given image on screen when ordered.
- k. Throughout procedure remains alert for any symptom of emergency or adverse reaction to contrast by patient. As soon as performer judges that there is a reaction, performer notifies radiologist. May assist as appropriate with emergency care.

8. Performer notes radiologist's orders on how to proceed with the examination based on review of the serial aortograms and/or videotape image:

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- a. Performer notes whether radiologist will repeat any steps with a change in injection site, with injection of additional contrast, with a change in technical factors, with different projections, and/or with different injection pressure. If so, performer repeats appropriate steps as described after making required adjustments.
- b. If abdominal aortography has been carried out prior to thoracic aortography, performer notes whether radiologist will go ahead with thoracic aortography.
- c. If thoracic aortography has been carried out prior to bronchial arteriography, performer notes radiologist's orders on the sequence for probing for and catheterizing the bronchial arteries.
- d. If abdominal aortography has been carried out, performer notes whether selective catheterization will be done such as for study of adrenal, renal, portal venous systems, inferior mesenteric circulation:
  - i) Notes orders for area of interest and catheterization sequence.
  - ii) Notes orders for serial magnification technique and degree of magnification. Sets up as described.
  - iii) Notes orders for spotfilming and any orders on cassette spotfilm program or format. Sets up as described. If magnification technique will be combined with spotfilming, performer checks that spotfilm device can be raised to appropriate height from table when appropriate.

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iv) Notes new orders on injection pressure, program for serial films, biplane, serial stereo filming, videotaping as described. Sets up as appropriate as described. v) Notes orders on use of vasoactive drugs and prepares as described. 9. If radiologist decides to repeat any exposures, performer resets technical exposure factors, pressure settings, etc., as required, and repeats appropriate steps. If radiologist decides to have additional views made, performer notes radiologist's orders and prepares as appropriate: a. Notes orders for a change in amount of contrast, change in pressure settings for automatic injection, and/or the rate and speed for serial filming. Adjusts equipment as appropriate. b. If radiologist orders additional views, performer makes any changes in x-ray tube position, angulation and/or position of serial changer and/or position of patient as appropriate. c. For thoracic aortography after abdominal aortography performer assists with fluoroscopy while radiologist advances catheter to the thoracic aorta. Proceeds as described with serial filming, processing and review. 10. For selective visceral arteriography performer may proceed as follows: a. For selective bronchial arteriography, performer assists with fluoroscopy as described while radiologist proceeds with probing, catheter placement, and check for	each bronchial artery to be entered. i) Performer is alert to pain response in patient as indication of entry into intercostal artery. Informs radiologist at once. Stands by to assist. May reassure patient. ii) Performer may assist in preparing appropriate amount of contrast for injection as ordered by radiologist. iii) Repeats set-up for single or biplane seriography, hand or low automatic pressure injection, magnification as described earlier. Sets program for seriography allowing for subtraction masks if requested and for filming of appropriate phase, per-second intervals as ordered, as described earlier. iv) Positions table or helps position patient for supine, lateral and/or oblique projections as ordered. v) Assists with injection of local anesthetic if ordered. vi) Centers, collimates and shields as appropriate for area of interest. vii) Repeats filming in coordination with injection as described earlier. Repeats processing of films and placement for review. Repeats steps for processing of subtraction prints as described earlier. viii) As radiologist decides on additional vessels to be entered and opacified, performer continues as ordered, as described. Performer adjusts positioning, centering, technical factors, pressure setting, amount of contrast, rate and speed of serial programs as ordered for each injection.

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b. For selective abdominal visceral angiography, performer assists with fluoroscopy as radiologist advances catheter(s) from the aorta to selected vessel(s). Depending on area of interest or purpose of study, performer carries out appropriate steps as ordered:

i) For study of abdominal bleeding, may set up for serial magnification as described. Removes grid if not already done. May assist with treatment by preparing and attaching syringe with vasoconstrictor solution to pressure injector. Sets to flow as ordered for period of time ordered.

ii) For renal arteriography, may set up for biplane seriography, videotaping from TV monitor, magnification. May position table or patient for AP, lateral and/or posterior oblique projections. If videotape of aorta was made, performer may rerun for radiologist and "freeze" the image selected; then inverts and places image on TV monitor so that it is superimposed over actual fluoroscopic image. May encourage patient to report any pain felt using catheterization. May encourage patient to strain when ordered (Valsalva maneuver) by radiologist.

iii) For celiac and/or hepatic arteriography, performer may set up for serial magnification. May position for AP and/or lateral projections. May set serial program to include portal hepatic (venous) phase. May reassure patient about sensation of warmth felt over area of liver if hepatic artery is opacified.

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iv) For superior mesenteric arteriography, may assist with injection of vasodilator. Positions for AP and/or lateral projections.

v) For pancreatic angiography and/or arterial portography, performer may assist as appropriate with bilateral simultaneous opacification of celiac and superior mesenteric arteries or with sequential technique. May set up for serial stereography. May assist with injection of vasoconstrictor. Positions for AP and/or right posterior oblique views. Has angiograms processed and places for review. After review notes whether radiologist will proceed with pancreatic pharmacoangiography, superselective pancreatic angiography, or will order subsequent percutaneous splenoportography.

vi) If radiologist proceeds with pancreatic pharmacoangiography, performer sets up for and assists with three sets of serial films. With the first, assists with injection of vasoconstrictor in one vessel, simultaneous opacification, and serial filming of two vessels.
With the second, waits until ordered and assists with injection of vasodilator, simultaneous opacification and serial filming.
With the third, waits as ordered and assists with simultaneous injection of vasoconstrictor, opacification and filming. Makes lateral views of the arterial phase.

vii) If radiologist proceeds with superselective pancreatic angiography, performer may assist

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with injection of vasoconstrictor, may set up for serial stereography. Assists with fluoroscopic viewing of sequential catheterization of the selected arteries.

viii) For inferior mesenteric arteriography, performer may assist with injection of vasodilator. Positions for lateral and/or left posterior oblique projections.

ix) For adrenal angiography, performer may assist with injection of vasodilator. May position for AP and/or anterior oblique projections. May set up for spotfilming, magnification. If orders are for spotfilming, operates exposure controls as ordered, or positions table, tube, or patient as ordered. If spotfilm attachment uses cassettes, performer may unload as used, identify, and insert additional cassettes.

x) For retroperitoneal arteriography, may assist with catheterization, spotfilming, and/or seriography as described for one artery at a time. May assist with injection of vasoconstrictor.

c. Depending on institutional procedures, performer may keep radiologist informed of cumulative exposure as shown on fluoroscope timer indicator.

d. For each set of serial films performer resets technical exposure factors, pressure settings, etc., as required; repeats appropriate steps for collimation, shielding, centering serial changer(s) and x-ray tube(s), setting angulation, making exposures as described.

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e. Performer may have spotfilms processed at once. With spotfilm camera, performer advances the film so that all exposures made will be wound on the take-up spool in the roll film cassette. Replaces dark slide on camera lens. Uses device to cut film and create a light shield. Resets counter and removes film cassette.
With cassette spotfilms, removes any markers for further use. Attaches ID card for use with flasher if appropriate. May sign or have radiologist sign requisition sheet.

f. Performer has subsequent sets of spotfilms and/or angiograms processed and presents to radiologist for review as described.

i) Repeats as appropriate for each vessel to be opacified and awaits further orders.

ii) Continues until radiologist indicates that examination is completed.

g. Performer may assist in emergency care of patient by placing tilt table in Trendelenburg position when ordered, assisting with treatment for internal bleeding as described, assisting with injection of anticoagulant, or application of hot packs to avoid thrombic occlusion, as ordered.

11. When informed by the radiologist that the radiographic examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

a. May assist while radiologist removes connecting tubes, syringes, and catheter(s). Removes any markers from patient's body.

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b. May prepare to apply pressure to arterial puncture site when ordered. May prepare to apply pressure dressing to puncture site after manual pressure has been applied. c. Performer coordinates with anesthesiologist if present and/or other staff members responsible for recovery and after-care of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room. d. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders additional examination and/or delayed abdominal film or tests. e. Performer records the examination according to institutional procedures. May include date, room, examination type, the serial views and any spotfilms taken, the technical factors used, and film size. May record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet. f. Performer may record the fluoroscopic exposure including exposure time and rad dosage from posted data. g. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements. Makes sure that any non-disposable guide wires and catheters are cleaned and flushed immediately after use and before sterilization.	h. Performer may return accessories such as computer control cards and immobilization devices to appropriate locations or has this done. i. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. j. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

TASK DESCRIPTION SHEET

Task Code No. 512

This is page 1 of 17 for this task.

1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected and set for fluoroscopy;radiologist assisted with puncture,catheterization;pt. and equipment positioned or set up for automatic or hand injection,conventional or serial filming;filming coordinated with injection;angiograms sent for processing,radiologist's review; procedures repeated,continued as ordered;examination recorded;angiograms placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen; computer control panel,cable,keypunch cards;gowns, gloves;masks;technique,standard view,tube rating, rad exposure charts;phantom;x-ray generator(s),tube (s),control panel(s),extension cones;fluoroscopy unit,TV monitor,grid,image intensifier;cassettes; shielding;collimator(s);serial changer;tilt-table, radiolucent table top;R-L, ID device or markers;automatic injector;immobilization devices;tape;ECG equipment;emergency cart;sterile procedure tray for puncture,catheterization;antiseptic,saline,anticoagulant,local anesthetic,iodine based contrast, disinfectant solutions;speculum;tourniquets;swabs, drape,syringes;stretcher;wheelchair;calipers

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. **If "Yes" to q. 3:** Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Non-pediatric female pt;radiologist;nurse;co-worker

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking selective pelvic angiograms of non-pediatric gravid or nongravid female pt. by reviewing request; measuring,reassuring pt.;setting up for fluoroscopy, conventional or serial filming,hand or automatic injection;assisting with sterile puncture,catheterization;identifying films;applying shielding;collimating;setting technical factors;positioning,immobilizing pt.;making serial films in coordination with injection;having films processed,reviewed;continuing, repeating,adjusting as ordered;assisting with termination;placing radiographs for use;recording examination.

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Performer receives or obtains the x-ray requisition form,patient identification card, and any appropriate medical-technical history for a non-pediatric female patient scheduled for pelvic arteriography (contrast study of uterine arteries, placentography and/or ovarian arteries by means of catheter abdominal aortography and/or selective catheterization) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s).

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for and the purpose:

      1) Notes whether patient is pregnant (gravid) or not (nongravid), whether purpose of study is for diagnosis, evaluation, localiza-

OK-RP;RR;RR

6. Check here if this is a master sheet..(x)

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tion of placenta, and/or placement of catheters for chemotherapy.

- ii) Notes area of interest, whether bilateral catheterization will be involved (for chemotherapy).
- iii) Notes whether selective ovarian catheterization may be done.

b. Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is emergency patient.

c. Notes name of radiologist in charge, names of other staff members to assist, examination room, time scheduled.

d. Performer notes decisions and orders on technique and equipment:

- i) Notes selected puncture site(s).
- ii) Notes whether conventional x-ray equipment or serial film changer is to be used. Notes whether hand or automatic pressure injection will be involved.
- iii) Notes types, sizes and length(s) of needles, guide wires and catheter(s), whether catheter is to be premarked to eliminate need for fluoroscopic control (for pregnant patient). Notes length at which catheter is to be marked if ordered.
- iv) Notes whether tourniquets will be used, radiopaque vaginal speculum to define position of external cervical os (for placentography). Notes type and amount of iodine based contrast solution, local anesthetic, saline, antiseptic, anticoagulant solutions ordered.
- v) Notes whether ECG monitoring has been ordered.
- vi) If serial filming has been ordered, notes type of changer such as cassette, roll film, cut film, whether computer controlled, whether equipped with see-through top. Notes whether table will be normal tilt table, angiography table, whether changer can be kept in place during procedure, will be rolled into position, or whether patient will be moved from table (on radiolucent top) to changer after catheterization. With computer controlled changer notes whether program has been selected for control panel.

e. Considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment and the area of interest.

- i) Notes appropriate sterile procedures required, appropriate shielding for the examination. Notes whether film processing equipment is available adjacent to procedure room.
- ii) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.

f. Performer notes relevant information about the patient's history and orders for prior preparation:

- i) Notes whether patient has prior history of allergic reaction to contrast or history of allergies. Notes whether allergy test has been ordered and, if so, results.

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ii) Depending on institutional procedures, performer notes whether nongravid female patient may be pregnant; reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus. For gravid patient notes length of pregnancy.

iii) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether history of extensive radiography should be reported to radiologist.

iv) Notes how patient will arrive for examination (whether in wheelchair, on stretcher, accompanied by staff,whether patient will be coherent,or will already be sedated).

v) Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as respiratory or heart disease, communicable or infectious condition, presence of IV drip, urinary catheter, incoherence.

vi) Performer notes whether there are orders for prior preparation of patient such as therapeutic diet, allergy test, lab tests, cessation of oral contraceptive, prior abstinence from morning meal, cleansing enemas, catheterization of bladder,start of IV drip, prior administration of sedation, tranquilizer, antihistamine, other medication, shaving of puncture site(s).

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Notes appropriate timing for medications to take effect.

vii) Checks whether all procedures have been carried out and at appropriate time, and that all reports ordered are with patient's chart. If there is any problem, arranges to have procedures carried out, examination postponed to allow proper timing, reports problem to appropriate staff member, or plans to inform radiologist.

g. Depending on institutional procedures, notes whether performer is to set up equipment and/or prepare patient personally, or whether performer will join angiography team in examination room.

h. If referring physician has requested that prior films,ultrasonograms, scans and test results already on file be sent with current radiographs,and if not already with patient's jacketed material,arranges to have these delivered.

i. If the performer determines that the request is not properly authorized, is incomplete, that suffucient information is lacking for performer to prepare properly, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

2. Performer prepares ahead so as not to keep patient in examination room longer than necessary. Determines what prior preparations will be needed, such as cleaning and preparation

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of equipment and accessories, proper dress. May carry out any or all of the following:

a. Goes to appropriate room in the department for the type of examination involved and the equipment required, such as angiography suite, or room assigned on requisition sheet.
b. Checks that room is supplied with the type of equipment ordered.
c. May decide to clean x-ray equipment or arranges to have this done. Washes hands as appropriate.
d. Reviews the technique chart(s) for the unit(s) to be used (serial changer or conventional x-ray unit, fluoroscopy unit).

   i) Locates information for the areas of interest and the views likely to be required. Takes note of the exposure factors to be used for overheads and fluoroscopy. Considers preference of the radiologist involved, conversions needed to account for patient's age, condition, areas of interest, presence of contrast. Notes newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).
   ii) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.
   iii) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

e. Checks for appropriate film supplies:

   i) If serial changer calls for roll film, performer checks that there is an adequate supply loaded in changer for the needs of the examination, and that the film is properly loaded.
   ii) If serial cassette changer or bucky will be used, performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Checks that these are loaded with appropriate speed and type of film and grid combinations depending on the patient's size, area of interest, techniques to be used, type of equipment, and institutional practices.
   iii) If adequate supply is not in room, arranges to obtain or decides to obtain personally.
   iv) Checks that equipment or device is available to number serial films, or checks that cassettes such as vacuum cassettes are prenumbered and are in numerical order.

   May prepare identification strip using tape and lead numeral giving appropriate ID information for placement on table or on cassette(s).

   May prepare for use of flashcard by checking that there is

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piece of lead on film holder surface; may write out ID information on card if not received with requisition. Checks identification against requisition sheet.

May place card as appropriate for use with automatic marking device.

v) Makes sure that right (R) and left (L) markers are available for use.

f. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator(s) and checks that each indicator light shows that machine(s) is (are) "warmed up," or turns on main switch as appropriate to equipment and allows time for machine(s) to "warm up."

Makes sure that all circuits have been stabilized. If appropriate, checks each line voltage meter and, if needed, turns compensator dial(s) until needle is aligned properly on line meter.

g. Performer sets up and checks fluoroscopy equipment:

- i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.
- ii) Sets x-ray generator mode selector to fluoroscopic mode.
- iii) If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.
- iv) If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

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- v) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position.
- vi) If a grid will be used with the image intensifier for fluoroscopy, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.
- vii) May adjust distance between focal spot and image intensifier (focal spot to film distance, FFD). May check that TOD is 15 inches or more.
- viii) Performer may collimate fluoroscopy tube depending on nature of the equipment and controls. May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or may set shutter mode selector to automatic collimation.
- ix) To check fluoroscopy mode, if not already done, performer places phantom or appropriate test object on radiography table where patient's area of

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interest will be centered for examination.

Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.

If not already done, moves image intensifier into position; centers (over or under) the area of interest.

Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate.

Views test object being fluoroscoped on TV monitor.

Adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.

Checks mA meter and notes whether appropriate reading is obtained.

Checks that TV brightness controls are operating and adjusts for preliminary viewing.

Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

h. Performer may set up and check serial changer as appropriate to equipment:

   i) As appropriate, sets x-ray mode selector for overhead filming.
   ii) If orders have been given for the computer program(s) to be used (giving the number of films to be taken, per second intervals, number of separate series, and possibly a program to coordinate with automatic pressure injection), performer arranges to have keypunch control card prepared, or delivered and checked, or decides to do personally. When orders have been given and control card is ready, performer places control card as appropriate in control panel of computer.
   iii) Depending on the type of film changer (if any) and examination table to be used, performer may wheel see-through horizontal changer into position under angiography table, may place changer so that patient may be moved to changer on radiolucent top after catheterization, or may place changer so that it may be placed under table after fluoroscopy. May set up in vertical position next to table for lateral filming; may check that upright bucky is available for lateral filming.
   iv) May set serial film rate that is standard for procedure and await radiologist's further orders. May cycle changer to check operation. If so, makes sure that anode is not rotating.

i. May set up and check automatic pressure injection equipment as appropriate to the type to be used (if any). Makes sure machine is grounded.

j. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

k. Performer notes whether ECG and vital sign monitoring equipment (if ordered) and emergency cart are present. Notes who will be assigned to monitor.

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l. May check that procedure tray for the examination has been properly prepared or decides to do personally.

  i) Depending on radiologist's orders, performer may check for appropriate types and sizes of puncture needles, tourniquets, catheters, syringes, scalpels, guide wires, forceps, dressings. Notes whether appropriate antiseptic, saline, anticoagulant, and local anesthetic solutions are present. If appropriate, checks that sterile catheter has been correctly premarked as ordered. May arrange to have done or does personally. Makes sure to use sterile procedures so as not to contaminate catheter.
  ii) Checks that appropriate aqueous iodine based contrast solution is present in the amount ordered. Checks that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool.

m. Checks that proper accessories are available for procedure:

  i) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure, that appropriate shielding is available for placement between radiologist and the patient.
  ii) Checks that appropriate immobilization devices are present.
  iii) Checks that extension cones are available.
  iv) Checks for hospital gowns, masks, gloves to be worn for sterile procedure. May check for emesis basin and towels.

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  v) May set up footboard, shoulder rests, hand holds on tilt table.

3. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, any prior films, scans, and lab reports to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready:

  a. If performer is to prepare patient in procedure room, may proceed as follows:

    i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.
    ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room (wheeled on stretcher if patient has been sedated).
    iii) Performer greets a coherent patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet, referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.
    iv) Has patient positioned or makes patient comfortable on examina-

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tion table or on table-top over changer. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to table.

If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.

Performer may decide to assist patient to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.

If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.

v) Makes sure patient is being attended and there is no danger patient will fall off table. If patient has respiration, cardiac or infusion equipment or urinary catheter attached, makes sure that equipment is being monitored and is not dislodged.

vi) Checks that patient is in gown with all jewelry removed; may check that patient is being kept warm.

vii) If not already done, questions patient or accompanying staff about any prior preparations and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

viii) If appropriate and not already done, performer questions non-gravid patient of child bearing age regarding possible pregnancy.

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ix) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is newly pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

x) Answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning or degree of coherence. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

xi) Notes the patient's body type, whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points will be easy to find.

xii) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the body at the level(s) and in the direction(s) in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors. After measuring, has patient rest in as relaxed a position as possible.

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b. Performer may inform attending radiologist when patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films and scans to radiologist. Displays radiographs on view boxes.

  i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.
  ii) Performer may accompany radiologist to examination room, greet and/or introduce patient and staff members.

c. If not already done, performer joins radiologist, patient and other staff in examination room.

4. During radiologist's review of requisition, prior radiographic materials, and examination of patient, performer notes radiologist's orders:

a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.
b. If radiologist decides that additional preparatory steps are needed, performer may arrange to have these carried out and/or performer arranges to reschedule patient.
c. If radiologist will proceed, notes radiologist's final orders on sequence of examination:

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  i) Notes orders on the puncture site(s) chosen, use of local anesthetic, additional medication, types and sizes of materials,amount of contrast, type of filming, number of exposures and sequence or program for filming, rate per second,and intervals between sequences to allow for arterial, capillary and venous phases as required.
  ii) Notes orders on use of tourniquet, whether catheter placement will be fluoroscopically checked. Notes whether automatic injector will be used.
  iii) Notes whether speculum will be inserted, whether pubic and vaginal area will be cleansed.
  iv) Discusses sequence and timing of procedure with radiologist. May arrange signals for exposure, operation of fluoroscopic controls.

5. Performer carries out preparations for angiography as ordered by radiologist based on the part of the work for which performer will be responsible. May carry out any or all of the following:

a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray. May assist in preparation of catheter(s), puncture needles, syringes containing saline solution, local anesthetic, anticoagulant, contrast solution. Notes or checks amounts ordered. Checks contrast for signs of chemical deterioration.
b. May provide hospital gown, gloves, mask;provides lead apron and gloves

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to radiologist.

Performer provides anyone who will remain in room during exposure with appropriate protective shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure. Checks with radiologist on what shielding if any can be provided to patient.

6. If performer will be responsible for filming, prepares ahead for fluoroscopy, automatic or hand injection (including computer controlled), and conventional serial filming:

   a. Sets exposure factors:

      i) Performer selects the exposure factors for the first conventional overhead or for the serial filming as described, taking account of the patient's measurements and the presence of contrast.
      ii) At control panel, sets control for radiography mode, unless fluoroscopic check of catheter will be made prior to filming.
      iii) For serial filming or conventional exposure control selects milliamperage and chooses selectors for the correct focal size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.
      iv) For automatic phototimed exposure control, performer sets the category corresponding to the type of study and use of screens, bucky, etc., and, if appropriate, focal spot size. Sets a control corresponding to the selected field size (as listed on technique chart for phototiming). May set a kVp range button, if called for with equipment, corresponding to the appropriate kV range for the examination. Sets a density selector corresponding to the usual (or special) requirements for the study. Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.
      v) Depending on the equipment, may set controls to provide for use of manual tableside adjustment of collimator, table and x-ray tube height and position (unless these have already been set).

   b. Depending on equipment, performer may wheel serial changer out of the way until fluoroscopy is completed; may make sure that everything is ready to lift patient from examination table on radiolucent table top to serial changer after fluoroscopy.

      i) Sets program for serial film changer, automatic injector as appropriate. Checks that planned exposure time does not exceed available capacity of unit.
      ii) If not already done and computer program will be used, checks keypunch control card and places in computer control panel.
      iii) Performer may load cassette changer with proper number of vacuum or other type of cassettes as ordered. If appropriate, loads cut film changer

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or roll film changer. If the same cassette changer will be used for lateral and AP projections, loads only enough cassettes for series in the first projection to avoid artifact caused by shadow from last exposure of first projection on the first cassette to be used in next projection.

iv) For computer controlled unit, plugs synchronization cable from control unit into appropriate receptacle on the x-ray control panel.

v) Performer may set up equipment for automatic marking of films in numerical sequence or records cassette numbers for the sequence.

c. Performer may attach identification information to the cassette(s), or table top:

i) Places right or left marker on film holder or table top as appropriate to the study and projection, or depresses appropriate R or L button for automatic marking. May tape lead markers to patient's body.

ii) If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.

iii) If patient identification information is to be entered by use of flasher, sets flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.

iv) Performer may place patient's card into card tray for equipment using automatic film marking device.

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v) For conventional filming, performer places cassette in bucky. May manually pull out bucky tray and open retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position until fluoroscopy is completed.

d. Performer sets the focal-film distance (if not already done). Operates controls or manually moves the x-ray tube into place. Checks focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

e. If automatic pressure injection is to be used, performer may attach tubing to syringe(s) containing the contrast solution using sterile technique. Checks that there are no air bubbles. If appropriate, makes sure machine is on "standby."

i) Attaches to machine and mounts syringe(s) as appropriate.

ii) If automatic injection is not computer controlled, sets flowrate dial for the cc's per second ordered by radiologist.

iii) When ordered by radiologist, sets pressure control as designated.

f. If performer is to assist with preparation of patient for catheterization, washes hands observing sterile technique when appropriate.

i) If not already done, may arrange to have puncture site(s) shaved and prepared (right and/or left femoral artery).

ii) Performer may position patient on examination table in supine or modified lithotomy position.

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- iii) May assist with cleansing of patient's vulva, perineum and vagina using sterile technique.
- iv) At appropriate time may position patient for access to puncture site(s). Abducts supine patient's legs and exposes the femoral artery on the side(s) to be punctured below the inguinal ligament, as high as possible, but allowing for later compression proximal to puncture site.
- v) Immobilizes patient as appropriate. May adjust shoulder supports; may use wrist restraints.
- vi) May swab puncture site area(s) with antiseptic solution and cover surrounding area with sterile towels.
- vii) If appropriate, may make sure that ECG monitoring leads have been applied, or decides to do personally.

g. Makes sure that everyone to remain in room is properly shielded; may place lead screen in place if radiologist will inject contrast by hand.

h. May receive or obtain a clean hospital gown, cotton "boots," cap and mask. Dons these before approaching sterile area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids touching patient, drapes, radiologist, nurse, or instrument table with non-sterile object.

i. Informs radiologist when patient and materials are ready.

j. During injection of local anesthetic, puncture, placement of needle and advancing of catheter, performer assists as appropriate:

- i) May hand materials and supplies asked for using sterile technique.
- ii) Unless premarked catheter is being used, performer may assist with fluoroscopic viewing of needle and progress of catheter placement. On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders.
- iii) Performer may operate tilt table on orders from radiologist, or assist in positioning patient as ordered. Continues as ordered.
- iv) May assist with attachment of syringes to flush catheter, inject contrast solution for fluoroscopic check of catheter placement.
- v) Once catheter position is judged satisfactory, may tape into position,maintaining sterile field.
- vi) Repeats as appropriate for alternative site or bilateral catheterization.
- vii) Performer may assist with placement of tourniquets to apply pressure over the femoral arteries.

7. When the radiologist has advanced the catheter(s) to the appropriate first location for serial or conventional filming, performer coordinates with the radiologist when so ordered:

   a. May assist in positioning patient on table or over changer:

   - i) May assist in moving patient on table top to horizontal changer.
   - ii) May roll horizontal or vertical changer into position under and/or beside angiography table, or positions cassette in bucky.

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b. Positions patient or assists in positioning for AP, lateral or oblique projections as ordered:

   i) Has patient lie in a supine position on the table with median sagittal plane centered to midline.
   Adjusts shoulders and hips so that they lie on single transverse planes. May have patient flex elbows and abduct arms.
   May have patient flex knees, abduct thighs. Supports.

   ii) When positioning a patient with a balloon catheter or IV drip in place, performer makes sure that no radiopaque part is lying over a part to be exposed, or that patient is not lying on catheter clamp. Makes sure to avoid any actions that will separate catheter tubing from drainage bottle or dislodge IV needle.

   iii) For an AP projection of the abdominal aorta and/or pelvic arteries performer centers to the median sagittal plane just above the level of the symphysis pubis or the iliac crests, or as ordered. Directs the central ray at right angles to center of area of interest, or at 15° cephalad, or 5° caudad, depending on area of interest, or as ordered.

   iv) For AP oblique projections, performer starts with patient in supine position. Notes whether bilateral views are ordered or side of interest. Depending on side of interest, rotates patient about 30° and supports elevated side or rotates table. Centers the pubic arch on the side of interest to midline. May have patient extend and abduct upper thigh. Places arms in comfortable position with shoulders in a single transverse plane. Centers to a point about two inches above the symphysis pubis. Directs central ray at right angles to midpoint of film or at angle specified. Repeats for opposite side if bilateral study is ordered.

   v) For lateral projections using horizontal beam, performer maintains patient in supine position. Notes side of interest and positions vertical bucky or changer centered to coronal plane at the pubic arch at a level about two inches above the symphysis pubis.
   Directs central ray horizontally across table at right angles to midpoint of film. Reverses position of central ray and film for opposite side lateral view.

c. If not yet completed, performer immobilizes patient in position.

   i) Places restraining bands, strips of gauze, and adhesive tape as needed.
   Avoids use of compression band across abdomen.

   ii) May check that there is no rotation of pelvis by measuring the distance from the anterior superior iliac spine to table top on each side. Overcomes rotation of pelvis due to swelling or atrophy by elevating appropriate side.

   iii) After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

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iv) Checks final positioning using light in collimator. Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows as reference for center of field, and uses the collimator light to center the tube to the part.

v) Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube to provide better centering.

d. Once the patient has been positioned and immobilized, performer adjusts the collimator so as to expose only the area of interest as defined by radiologist.

i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.

ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

e. If not already done, performer applies any lead shielding possible to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.
Makes sure that anyone remaining in room is supplied with lead gloves and apron and stays out of central beam, especially horizontal film.

f. Makes sure controls are properly set for radiography mode and that patient is still in position. Checks that serial changer is loaded, locked and ready.

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8. Performer coordinates with radiologist to make exposure(s) at proper time in relation to injection of contrast.

a. Depending on whether injection is by hand or automatic, manually initiated or computer controlled, performer starts the automatic film changer on signal of the radiologist, or initiates the computer control of the injection and serial exposures at the control panel when ordered.

i) While exposure is underway, performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

ii) May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.

iii) With phototimer notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure.

iv) After exposure removes cassettes for processing and removes markers for further use.

b. If additional injections and exposures are required, such as right angle, opposite side, or oblique projections, performer sets up equipment as appropriate.

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i) Resets technical factors for the projection involved if required; repeats collimation, shielding and coordination of injection and making exposures as described.
ii) If film changer is being used, reloads changer with cassettes or adjusts roll or cut film transport for additional serial projections. Sets up as described earlier.

c. Performer has the exposed film or cassette(s) processed at once or decides to do personally:

i) Makes sure that serial films are numbered for appropriate order in sequence.
ii) Attaches ID card for use with flasher if appropriate. May sign requisition.
iii) While films are being processed, makes sure that patient is comfortable and, if necessary, attended by radiologist, staff member, or self.
iv) When the exposed films have been processed, performer may place on view boxes in appropriate serial order. Notifies radiologist when they are ready. May hang prior films as well.

d. Throughout procedure performer remains alert for any symptoms of emergency or adverse reaction to contrast. As soon as performer judges that there is a reaction, performer notifies radiologist. May assist as appropriate with emergency care.

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9. While radiologist reviews first series of angiograms, performer notes decisions on how examination will continue:

a. Performer notes whether radiologist will repeat any steps with a change in injection site, with injection of additional contrast, with a change in technical factors, with different projections, and/or with different injection pressure.

i) Performer notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."
ii) If radiologist decides to repeat any exposures or orders additional views, performer resets technical exposure factors, pressure settings, angulation, patient position as required and repeats appropriate steps.

b. Performer notes whether radiologist will proceed with abdominal aortography, selective ovarian arteriography and/or renal arteriography depending on the stage of the examination and the angiography already performed.

i) Performer notes orders for area of interest and catheterization sequence.
ii) Performer notes new orders on injection pressure, program for serial films or conventional filming, as described. Sets up as appropriate as described.

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c. For selective catheterization or abdominal aortography, assists with fluoroscopy while radiologist advances catheter to each location selected. Proceeds as described with serial or conventional filming, processing, and review:

  i) Performer may assist in preparing appropriate amount of contrast for injection as ordered by radiologist.
  ii) Repeats set-up for overhead or serial filming, hand or automatic pressure injection, as described earlier. Sets program for seriography allowing for filming of appropriate phase, per-second intervals as ordered, as described earlier.
  iii) Positions table or helps position patient for supine, lateral and/or oblique projections as ordered.
  iv) Centers, collimates, and shields for area of interest as appropriate.
  v) Repeats filming in coordination with injection as described earlier. Repeats processing of films and placement for review.
  vi) As radiologist decides on additional vessels to be entered and opacified, performer continues as ordered as described. Performer adjusts positioning, centering, technical factors, pressure setting, amount of contrast, rate and speed of serial programs as ordered for each injection. Sends for processing and places for review as described.
  vii) Performer shows subsequent sets of angiograms to radiologist as processed, and proceeds as described above until radiologist

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indicates that examination is completed.
  viii) Removes tourniquets when ordered.

d. Performer may assist in application of hot pads to avoid thrombic occlusion, if ordered.

10. When informed by the radiologist that the radiographic examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

a. Except if catheters have been placed for chemotherapy, may assist while radiologist removes connecting tubes, syringes, and catheter(s). Removes any markers from patient's body.
b. May prepare to apply pressure to arterial puncture site when ordered. May prepare to apply pressure dressing to puncture site after manual pressure has been applied.
c. Performer coordinates with staff members responsible for recovery and after-care of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room.
d. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders additional examination and/or delayed films or tests.
e. Performer records the examination according to institutional procedures. May include date, room, examination type, the serial or overhead views taken, the technical factors used, and film sizes. May record the number of exposures made of each view including retakes; may enter the estimated ra-

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diation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet. f. Performer may record the fluoroscopic exposure including exposure time and rad dosage from posted data. g. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements. Makes sure that any non-disposable guide wires and catheters are cleaned and flushed immediately after use and before sterilization. h. Performer may return accessories such as computer control cards and immobilization devices to appropriate locations or has this done. i. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. j. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

TASK DESCRIPTION SHEET

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1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected,set for fluoroscopy;scout films taken;radiologist assisted with arm-to-tongue test,puncture,catheterization;pt. and equipment positioned,set up for automatic injection, single or biplane serial filming;filming coordinated with injection;films sent for processing,radiologist's review;procedures repeated,continued as ordered;examination recorded;angiograms placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen;computer control panel,cable,keypunch cards;gowns, gloves,masks;technique,standard view,tube rating,rad exposure charts;phantom;x-ray generator(s),tube(s), control panel(s),extension cones;fluoroscopy unit, TV monitor,grid,image intensifier;cassettes;shielding;collimator(s);serial changer(s);tilt-table,radiolucent table top;R-L,ID device or markers;automatic injector;immobilization devices;tape;ECG equipment; emergency cart;sterile procedure tray for puncture, catheterization;antiseptic,saline,anticoagulant, Decholin,local anesthetic,iodine based contrast,disinfectant solutions;tourniquets,swabs,drape,syringes; marking pen;stretcher;wheelchair;calipers;arm board

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.;radiologist;anesthesiologist;nurse;co-worker

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking intravenous angiocardiograms of any pt. by reviewing request;measuring,reassuring pt.;setting up for fluoroscopy,serial filming (single or biplane),manual or automatic injection;making scout film(s);assisting with arm-to-tongue test,sterile puncture,catheterization;identifying films;applying shielding;collimating;setting technical factors;positioning,immobilizing pt.;making serial films in coordination with injection;having films processed, reviewed;repeating,adjusting as ordered;placing angiograms for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a patient scheduled for intravenous angiocardiography (contrast study of the heart, great vessels, such as pulmonary arteries and descending aorta, by means of percutaneous needle or catheter injection into a vein or the superior vena cava) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s).

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for, the purpose and the areas involved.

      1) Notes whether the areas of interest include the heart, pulmonary arteries, thoracic or abdominal aorta, innomi-

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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nate arteries. Notes side of interest.

- ii) Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is emergency patient.
- iii) Notes name of radiologist in charge, names of other staff members to assist, examination room, time scheduled.
- iv) Notes whether direct needle puncture and injection or catheterization has been selected; notes side and site of percutaneous entry such as antecubital, axillary or femoral vein.

b. Performer notes orders on equipment and materials:

- i) Notes type of serial film changer ordered, whether cassette, roll film, cut film, whether single or biplane, whether computer controlled, whether equipped with "see-through" tape. Notes type of table, whether angiography table or normal tilt-table. Notes whether patient will be moved from angiography table to changer, whether changer will be rolled under or beside table, or whether, with see-through changer, horizontal changer will be kept in place under table throughout procedure.
- ii) Notes whether injection of contrast will be automatic with pressure injector or by hand.
- iii) Notes needle sizes and types, or sizes, lengths and types of catheters and guide wires as appropriate. Notes type and amount of iodine based contrast solution. Notes orders for saline, antiseptic, anticoagulant, anesthetic solutions.

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- iv) Notes whether Valsalva maneuver will be used, whether general anesthesia has been suggested.
- v) Notes whether ECG monitoring has been ordered, whether arm-to-tongue circulation time will be tested and recorded beforehand, or done as part of procedure.

c. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment, the examination ordered, and the area(s) of interest.

- i) May check that the type of equipment ordered is available in examination room assigned. If general anesthesia may be given, may check that x-ray equipment is compatible for use with anesthesia equipment.
- ii) Notes appropriate sterile procedures required, appropriate shielding for the examination.
- iii) Notes whether film processing equipment is available adjacent to procedure room.
- iv) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.

d. Performer notes relevant information about the patient's history and orders for prior preparation:

- i) Notes whether patient has prior history of allergic reaction to contrast or history of allergies. Notes whether allergy

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test has been ordered and, if so, results.

ii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.

iii) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether history of extensive radiography should be reported to radiologist.

iv) Notes how patient will arrive for examination (whether in wheelchair,on stretcher,accompanied by staff,whether patient will be coherent, whether already sedated).

v) Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as respiratory or heart disease, communicable or infectious condition, presence of IV drip, urinary catheter, behavioral disorder, incoherence.

vi) Performer notes whether there are orders on prior preparation of patient such as therapeutic diet, allergy test, lab tests, cessation of oral contraceptive, prior abstinence from morning meal, cleansing enemas, catheterizing of bladder, start of IV drip, prior administration of sedation, tranquilizer, antihistamine, other medication, shaving of puncture site. Notes appropriate timing for medications to take effect.

vii) Checks whether all procedures have been carried out and at appropriate time and that all reports ordered are with patient's chart. If there is any problem, arranges to have procedures carried out, examination postponed to allow proper timing, reports problem to appropriate staff member, or plans to inform radiologist.

e. Depending on institutional procedures, notes whether performer is to set up equipment and/or prepare patient personally, or whether performer will join angiography team in examination room.

f. If referring physician has requested that prior films, scans and test results already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have these delivered.

g. If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to prepare properly, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

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2. Performer prepares ahead so as not to keep patient in examination room longer than necessary. Determines what prior preparations will be needed, such as cleaning and preparation of equipment and accessories, proper dress. May carry out any or all of the following:

   a. Goes to appropriate room in the department for the type of examination involved and the equipment required, such as angiography suite, or room assigned on requisition sheet.
   b. May decide to clean x-ray equipment or arranges to have this done.
   c. Washes hands as appropriate.
   d. Reviews the technique chart(s) for the unit(s) to be used (single or biplane serial changer(s), fluoroscopy unit).

      i) Locates information for the areas of interest and views likely to be required. Takes note of the exposure factors to be used for overheads and fluoroscopy. Considers preferences of the radiologist involved, conversions needed to account for patient's age, condition, presence of contrast. Notes any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).
      ii) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.
      iii) Checks any new or unfamiliar exposure factors against the post-

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ed limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

   e. Checks for appropriate film supplies:

      i) With serial changer(s) using roll film, performer checks that there is an adequate supply for examination loaded in changer(s) and that film is properly loaded.
      ii) With serial changers using cassettes, and for scout films and check of needle placement, performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Checks that these are loaded with appropriate speed and type of film and grid combinations depending on the patient's size, area of interest, techniques to be used, type of equipment, and institutional practices.
      iii) If adequate supply is not in room, arranges to obtain or decides to obtain personally.
      iv) Checks that equipment or device is available to number serial films, or checks that cassettes such as vacuum cassettes are prenumbered and are in numerical order.
      May prepare identification strip using tape and lead numerals giving appropriate ID in-

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formation for placement on table or on cassette(s).
May prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write out ID information on card if not received with requisition. Checks identification against requisition sheet.
May place card as appropriate for use with automatic marking device.

v) Makes sure that right (R) and left (L) markers are available for use.

f. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator(s) and checks that each indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for machine to "warm up." Makes sure that all circuits have been stabilized. If appropriate, checks each line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

g. Performer sets up and checks fluoroscopy equipment:

i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.

ii) Sets x-ray generator mode selector to fluoroscopy mode.

iii) If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

iv) If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

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v) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position.

vi) If a grid will be used with the image intensifier for fluoroscopy, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

vii) May adjust distance between focal spot and image intensifier (focal spot to film distance, FFD). May check that TOD is 15 inches or more.

viii) Performer may collimate fluoroscopy tube depending on nature of the equipment and controls. May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or may set shutter mode selector to automatic collimation.

ix) To check fluoroscopy mode (if not already done) places phantom or appropriate test object

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on radiography table where patient will be centered for examination.

x) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest. If not already done, moves image intensifier into position; centers (over or under) the area of interest.

xi) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate.

xii) Views test object being fluoroscoped on TV monitor. Adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly. Checks mA meter and notes whether appropriate reading is obtained.

xiii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.

xiv) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

h. Performer may set up and check serial changer(s) as appropriate to equipment:

i) As appropriate, sets x-ray mode selector(s) for radiography mode.

ii) Depending on the type of film changer(s) and examination table to be used, performer may wheel see-through horizontal changer into position under angiography table, may place changer so that patient may be moved to changer on radiolucent top after catheterization, or may place changer so that it may be placed under table after fluoroscopy. May set up changer in vertical position next to table for erect or lateral filming, or may roll equipment out of way.

iii) May cycle each unit to check operation. If so, makes sure that anode is not rotating.

i. May set up and check automatic pressure injection equipment as appropriate to the type to be used (if any);makes sure it is grounded.

j. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

k. Performer notes whether ECG monitoring equipment (if ordered) and emergency cart is present. Notes who will be assigned to monitor.

l. May check that procedure tray for the examination has been properly prepared or decides to do personally.

i) Depending on radiologist's orders, checks for appropriate types and sizes of puncture needles, catheters, syringes, scalpels, guide wires, forceps, dressings. Notes whether appropriate antiseptic, saline, anticoagulant, and local anesthetic solutions are present. If arm-to-tongue circulation test is to be done, checks for presence of Decholin and injection equipment.

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ii) Checks that appropriate aqueous iodine based contrast solution is present. Checks that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool.

m. Checks that proper accessories are available for procedure:

- i) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure, that appropriate shielding is available for placement between radiologist and the patient.
- ii) Checks that appropriate immobilization devices for adult or child and type of procedure are present.
- iii) Checks that extension cones are available.
- iv) Checks for hospital gowns, masks, gloves to be worn for sterile procedure. May check for emesis basin and towels.
- v) May set up footboard, shoulder rests, hand holds on tilt table.

3. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, any prior films, scans, and lab reports to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready:

a. If performer is to prepare patient in procedure room, may proceed as follows:

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- i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.
- ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room (wheeled on stretcher if patient has been sedated; escorted or carried if child or adult patient is to have general anesthesia after entering department).
- iii) Performer greets a coherent patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet, referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.
- iv) Has patient positioned or makes patient comfortable on examination table or on table-top over changer. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to table.
  If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.

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Performer may decide to assist patient to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.

If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.

May have nurse carefully place young patient in supine position on table, or lifts patient carefully, supporting patient's head, and places on table.

v) Makes sure patient is being attended and there is no danger patient will fall off table.

If patient has respiration, cardiac or infusion equipment or urinary catheter attached, makes sure that equipment is being monitored and is not dislodged.

vi) Checks that patient is in gown, with all jewelry removed; may check that patient is being kept warm.

vii) If not already done, questions patient or accompanying adult about any prior preparations and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

viii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

ix) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

x) Answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning or degree of coherence. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

xi) Notes the patient's body type, whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points will be easy to find. For adult female notes whether breasts are large and pendulous. If so, may have staff member draw the breasts to the sides and hold in place with wide bandage.

xii) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the body at the level(s) and in the direction(s) in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors. After measuring, has patient rest in as relaxed a position as possible.

b. Performer may inform attending radiologist when patient is ready

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to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films and scans to radiologist. Displays radiographs on view boxes.

i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.
ii) Performer may accompany radiologist to examination room, greet and/or introduce patient and staff members.

c. If not already done, performer joins radiologist, patient and other staff in examination room.
d. During radiologist's view of requisition, prior radiographic materials and examination of patient, performer notes radiologist's orders:

i) If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.
ii) Notes radiologist's orders for scout film(s) of chest (and abdomen if appropriate), patient positioning, phase of respiration and projection(s). If biplane scouts are requested, notes whether alternating or simultaneous exposures are requested.
iii) May provide hospital gown, gloves, mask to radiologist.

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iv) Provides leaded apron and gloves to radiologist. Provides patient and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

4. Performer makes preliminary scout film(s) as ordered after making sure that patient is being attended. Sets up equipment for the examination before positioning and immobilizing patient:

a. Performer may place single or biplane changer(s) in position for AP and/or lateral projection(s) of the area of interest.

i) May set changer(s) for manual control so that only one scout exposure will be made. If so, loads changer with appropriate cassette or operates film transport.
ii) May select appropriate size cassette(s) and place in appropriate position(s) on table or in vertical cassette holder.
iii) Performer attaches appropriate identification information. May place right or left marker on cassette as appropriate to the study and projection or depresses appropriate R or L button for automatic marking. May tape lead markers to patient's body. May place identification information on appropriate corner of cassette; may set

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flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette. May place patient's card into card tray for equipment using automatic film marking device.

b. Performer sets technical factors for the scout film(s). Sets up for AP and lateral projections if biplane equipment will be used, or first scout projection:

  i) Performer selects the exposure factors for the preliminary scout projection(s) as described, taking account of the measurements taken of the patient.

  ii) At control panel sets controls for radiography mode. Selects milliamperage and chooses selectors for the correct focal size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

  iii) Depending on the equipment, may set controls to provide for manual tableside adjustment of collimator, table and x-ray tube height and position (unless these have already been set).

  iv) Performer may set the focal-film distance(s) if not already done. Operates controls or manually moves the x-ray tube(s) into place. Checks each focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

c. Performer prepares patient for final positioning:

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  i) Performer prepares patient on table over changer in supine or erect position. Plans for horizontal beam exposure for any erect or lateral projection. May place radiolucent support under patient for lateral projection of supine patient.

  ii) For lateral projection makes sure that vertical changer or cassette is on the side of interest at right angles to table.

  iii) Depending on patient's age and condition, performer may obtain help in positioning and immobilizing patient. May explain to staff member what is required.

  iv) With very young patient, performer may immobilize patient's arms by extending them and placing them along sides of head, next to the ears. May apply a sleeve made of a diaper, towel, pillowcase or orthopedic stockinet to hold arms so that sleeve holds arms above and behind head, one at each side. May apply a sleeve of stretch gauze or bandage to the pelvis. Wraps lightly to maintain patient in position.

  v) When positioning a patient with a balloon catheter or IV drip in place, performer makes sure that no radiopaque part is lying over an area to be exposed, or that patient is not lying on a clamp. Makes sure to avoid any actions that will separate catheter tubing from drainage bottle or dislodge IV needle. Remains alert to patient's respiration. Does not force flexion of the neck.

  vi) Arranges patient's body so that median sagittal plane is cen-

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tered to the midline. Arranges shoulders so that they lie on a single transverse plane. Centers film to part and keeps long axis parallel to film holder.

d. For projections of the chest, performer notes side and area of interest.

   i) For an AP supine projection (posterior view) of the chest, performer has patient assume supine position. May elevate thorax. May place patient's arms above head as described, or at sides with elbows elevated. May elevate patient's knees and place restraining band across legs. Centers median sagittal plane to midline at the level of the sternal angle for pulmonary arteries; centers to the midsternum for the vessels of the heart and aorta. Directs central ray vertically at right angles to midpoint of film.

   ii) For a lateral supine projection of the chest, performer centers cassette in vertical holder to the thorax with the midaxillary line of the body about 2 inches posterior to midline of film. For the pulmonary arteries, directs central ray horizontally at right angles to film, centered to the fourth thoracic vertebra; for heart and aorta centers to the sixth or seventh thoracic vertebra.

   iii) For erect projections of the chest, performer has patient sit facing a vertically placed cassette holder for PA projection; with back to film holder for AP projection; or with midaxillary line of torso at right angles to film and centered to midline for lateral projection.
   For PA projection, adjusts head so that median sagittal plane is at right angles to film. Has female patient's breasts held to the sides as described earlier. Has patient rotate and depress shoulders forward, flex elbows, and place back of hands well down on hips. Adjusts shoulders to a single transverse plane,with clavicles below the apices. Has patient keep shoulders in contact with holder. For pulmonary arteries directs central ray to the median sagittal plane at the level of the fourth thoracic vertebra; for heart and aorta, at the level of the sixth thoracic vertebra.
   For AP or lateral projections centers to seated patient as described above in (i) and (ii), as appropriate.
   Directs central ray horizontally at right angles to center of film.

e. For projections of the abdominal aorta, if ordered, performer maintains patient in supine AP position.

   i) With very young patient has patient's arms immobilized above and behind head next to ears as described; has lower legs immobilized as described, or tapes legs together just above knees; may turn head to one side. Gently extends head and neck and immobilizes with head clamp, webbing strap under chin, or sponges so that median sagit-

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tal plane of head is at right angles or parallel to cassette. May elevate patient's knees and place restraining band across legs.

- ii) With older patient elevates patient's shoulders and knees so that patient's back is in contact with table. Supports. Adjusts shoulders and hips so that they lie on single transverse planes. May immobilize ankles. Has patient flex elbows and abduct arms.
- iii) Performer centers film just above the iliac crests unless otherwise specified. Makes sure not to use visual points of muscle or fatty tissue and palpates for the crest of the bone.
- iv) Directs central ray horizontally for lateral projection and vertically for AP projection, directed to the midpoint of the area of interest, at right angles to the film.

f. If not yet completed, performer immobilizes patient in position.

- i) Places restraining bands, strips of gauze, and adhesive tape as needed. May use head clamp. Avoids use of compression band across abdomen or chest.
- ii) May check that there is no rotation of torso.
- iii) After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.
- iv) Checks final positioning using light in collimator. Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows

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as reference for center of field, and uses the collimator light to center the tube to the part.

- v) Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube to provide better centering.

g. Once the patient has been positioned and immobilized, performer adjusts the collimator so as to expose only the area of interest as defined by radiologist.

- i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.
- ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

h. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination. Makes sure that anyone remaining in room is supplied with lead gloves and apron and stays out of central beam, especially horizontal beam.

i. Performer may rehearse coherent patient in breathing out and holding or breathing in and holding, depending on area of interest and orders, or observes patient's breathing and plans exposure for the appropriate quiet phase such as after expiration.

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j. Performer makes the exposure:

  i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.
  ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells patient when to breathe as rehearsed and hold breath, or observes patient's breathing and times exposure to the appropriate quiet phase required.
  iii) Performer initiates exposure by pressing hand trigger or exposure control button (or appropriate control for simultaneous or alternating biplane exposure).
  iv) While exposure is underway, may check that mA meter records appropriate current as set, that kVp meter dips slightly.
  v) May watch for evidence of malfunction, such a line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
  vi) After exposure is completed, tells patient that he or she can relax. Returns to patient. Removes the cassette(s) and any markers for further use.

k. If single plane scout films in both AP and lateral projections are ordered (and if biplane equipment was not used), performer maintains patient in same position; removes radiolucent sponge if lateral will be followed by AP projection; and proceeds with second exposure as described.

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l. Performer arranges to have the scout film(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

  i) While film(s) are being processed, makes sure that patient is comfortable and attended by staff person or self.
  ii) Performer brings the processed scout film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist when the radiograph(s) are ready. May place prior films for viewing as well.

5. During radiologist's review of the scout film(s) performer notes radiologist's orders:

  a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.
  b. Performer notes whether radiologist requires a change in technical factors and/or patient positioning, centering, or central ray angulation for later serial filming.

    i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.
    ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as ap-

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propriate to avoid any need for future "retakes."

c. If radiologist will proceed, notes radiologist's final orders on sequence of examination, whether catheter or direct needle injection will be used, site of puncture, use of general anesthesia, orders for additional medication. Notes whether arm-to-tongue circulation time will be tested so that radiologist can order program for seriography.

d. For arm-to-tongue test, performer may proceed as follows:

   i) May position patient in supine position with appropriate arm extended so as to expose the antecubital venous site.
   ii) May tape arm to pad or arm board in extended position. May assist with application of tourniquet.
   iii) If not already done, may decide to prepare syringe with Decholin.
   iv) May swab entry site with antiseptic solution.
   v) May note or check time elapse from moment of injection to patient's report of bitter taste.
   vi) May record as dictated or noted.

e. Performer notes the radiologist's orders for the seriography to visualize the desired circulatory phases of right, left heart, pulmonary arteries, aorta, innominate arteries as decided.

   i) Notes the number of exposures and sequences, rate per second, and intervals between sequences. Notes number of injections such as one for AP, one for lateral projections, unless biplane equipment will be used. Notes phase of respiration for exposure.

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   ii) If computer program(s) are to be used (giving the number of films to be taken, per second intervals, number of separate series, and possibly a program to coordinate with automatic pressure injection), performer arranges to have keypunch control card prepared or delivered and checked, or decides to do personally. When control card(s) are ready, performer places as appropriate in control panel of computer.
   iii) With biplane study notes whether exposures will be simultaneous or alternating.

f. Performer notes final orders on types and sizes of materials, type and amount of contrast, use of automatic injection, orders for shielding, immobilization and preparation of puncture site.

g. Performer discusses the sequence and timing of the procedure. Notes whether placement of needle and/or catheter will be checked with fluoroscopy or overhead film. May arrange signals for operation of fluoroscope exposure controls, signals for serial exposure.

6. Performer carries out preparations for angiography as ordered by radiologist based on the part of the work for which performer will be responsible. May carry out any or all of the following:

a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray. May assist in preparation of catheters, puncture needle, syringes containing saline solution, local anesthetic, anti-

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coagulant, contrast solution. Notes or checks amounts ordered. Checks contrast for signs of chemical deterioration.

b. If performer will be responsible for filming, prepares ahead for use of fluoroscopy with surgical procedure, use of overhead film to check needle placement if ordered, automatic or hand injection (including computer controlled), and serial filming:

   i) May reset technical factors for fluoroscopy and serial filming based on radiologist's review of scout film(s) and the presence of contrast for postinjection films.

   ii) If check of needle and/or catheter position will be needed during surgical procedure, performer prepares cassette(s) with ID information as appropriate. May plan to use Polaroid cassette and processing equipment.

   iii) Depending on equipment, performer may wheel serial changer(s) out of the way until fluoroscopy is completed; may make sure that everything is ready to lift patient from examination table on radiolucent table top to horizontal (or biplane) serial changer after fluoroscopy.

   iv) Sets programs for serial changer(s), automatic injector as appropriate. Checks that planned exposure time does not exceed available capacity of unit. If not already done and computer program will be used, checks keypunch control card and places in computer control panel.

   v) Performer may load cassette changer(s) with proper number of vacuum or other type of cassettes as ordered. (If appropriate, loads cut film changer or roll film changer.) If the same changer will be used for lateral and AP projections, loads only enough cassettes for series in the first (lateral) position to avoid artifact caused by shadow from last exposure in one position on the first cassette to be used in next projection.

   vi) If biplane changers are to be used, performer notes whether the exposures will be simultaneous or alternating. Loads changers as appropriate.

   vii) For computer controlled units, plugs synchronization cable from control unit into appropriate receptacle on the x-ray control panel.

   viii) May set up equipment for automatic marking of films in numerical sequence or records cassette numbers for the sequence.

   ix) If automatic pressure injection is to be used,may attach tubing to syringe containing contrast solution using sterile technique. Attaches to machine and mounts syringe as appropriate. Checks that there are no air bubbles. Makes sure machine is on "stand-by." If automatic injection is not computer controlled, sets flow-rate dial for the cc's per second as ordered by radiologist;sets pressure control as designated.

c. If performer is to assist with preparation of patient for puncture and/or catheterization,washes hands observing sterile technique when appropriate. If not already done, may arrange to have puncture site shaved and prepared. May position patient for access to puncture site as follows:

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i) Places patient in supine position as described.

ii) For femoral vein puncture abducts patient's legs and exposes the femoral vein on the side to be punctured just below the inguinal ligament. May rotate thigh externally and immobilize.

iii) For antecubital vein puncture supports extended arm on side of puncture and exposes cubital area. May assist with application of tourniquet.

iv) For axillary vein puncture abducts arm on side of puncture and rotates hand so that palm faces upward and forearm is parallel with patient's head. Exposes pectoral muscle fold or other site as ordered.

v) Immobilizes patient as appropriate. May adjust shoulder supports.

vi) May swab puncture site area with antiseptic solution and cover surrounding area with sterile towels.

vii) If appropriate, may make sure that ECG monitoring leads have been applied, or decides to do personally.

d. Makes sure that everyone to remain in room is properly shielded; may place lead screen in place if radiologist will inject contrast by hand.

e. May receive or obtain a clean hospital gown, cotton "boots," cap and mask. Dons these before approaching sterile area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids touching patient, drapes, radiologist, nurse, or instrument table with non-sterile object.

f. Informs radiologist when patient and materials are ready.

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g. If patient is to have general anesthesia, performer awaits signal that procedure can begin.

h. During injection of local anesthetic, puncture,placement of needle, and/or advancing of catheter, performer assists as appropriate:

i) May hand materials and supplies asked for using sterile technique. Removes tourniquet when ordered.

ii) May assist with fluoroscopic viewing of needle and/or progress of catheter placement. On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders. Continues as ordered.

iii) Performer may operate tilt table on orders from radiologist, or assist in positioning patient as ordered.

iv) For overhead check of needle placement, performer places cassette as indicated by radiologist. Sets technical factors as appropriate for location as for plain films. Collimates to area of interest and makes exposure. Has film processed at once or decides to do personally. Places for radiologist to view. Continues as ordered.

v) May assist with attachment of syringes to flush catheter, inject contrast solution for fluoroscopic check of catheter placement.

vi) Once catheter position is judged satisfactory, may tape into position, maintaining sterile field.

vii) Repeats as appropriate for alternative site.

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7. Performer assists and coordinates filming with injection of contrast:

   a. Performer may position patient or assist as ordered depending on the injection site:

      i) Performer may assist in placing patient with puncture in arm or axillary vein in seated position. Maintains arm in extended position without flexing. Supports in position. Positions single or biplane changer(s) for first frontal and/or lateral projections as described.

      ii) Performer may adjust patient in supine position and adjust table to horizontal or Trendelenburg position as ordered over horizontal changer; may move changer into position under table; may assist in moving patient on table top to horizontal changer.

      iii) If appropriate for supine lateral or biplane filming, moves vertical changer into position.

   b. Performer checks that serial changer(s) are loaded and ready. Centers and adjusts the x-ray tube angulation as appropriate. Centers film in changer(s) to the specified area of interest and collimates to the smallest possible exposure area. Checks patient's shielding.

   c. Depending on whether injection is by hand or automatic, manually initiated or computer controlled, performer starts the automatic film changer(s) on the signal of the radiologist, or initiates the computer control of the injection and serial exposures at the control panel when ordered.

   d. If right angle views are required and biplane equipment is not being used, and if not already done, performer positions equipment for lateral filming after frontal projections as described.

      i) Resets technical factors for the projections involved if required, repeats collimation, shielding and coordination of injection and making exposures as described.

      ii) If one single plane changer is being used, reloads changer with cassettes or adjusts roll or cut film transport for additional serial projections. Sets up as described earlier.

   e. Performer has the exposed films processed at once or decides to do personally.

      i) Makes sure that serial films are numbered for appropriate order in sequence.

      ii) When the serial films have been processed, performer may place on view boxes with biplane frontal and lateral views together and in appropriate serial order. Notifies radiologist when they are ready.

   f. Throughout procedure performer remains alert for any symptom of emergency or adverse reaction to contrast. As soon as performer judges that there is a reaction performer notifies radiologist. May assist as appropriate with emergency care.

8. While radiologist reviews first series of angiograms, performer notes decisions on how examination will continue:

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a. Performer notes whether radiologist will repeat any steps with a change in injection site, with injection of additional contrast, with a change in technical factors, with different projections and/or with different injection pressure.

b. If radiologist decides to repeat any exposures, performer resets technical exposure factors, pressure settings, etc., as required and repeats appropriate steps.

c. If radiologist orders additional views, performer makes any changes in x-ray tube position, angulation and/or position of serial changer and/or position of patient as appropriate.

   i) For oblique positioning notes side of interest, whether PA or AP oblique positioning, erect or recumbent is required. Elevates appropriate side to obtain the desired angulation and/or adjusts tube-film angulation. Centers as ordered.

   ii) Centers, collimates, and provides shielding as appropriate.

d. Repeats filming in coordination with injection as described. Repeats processing of films and placement for review.

e. Performer shows subsequent sets of angiograms to radiologist as processed, and proceeds as described above until radiologist indicates that examination is completed.

f. Performer may assist with application of hot pads to avoid thrombic occlusion, if ordered.

g. If radiologist orders an additional examination for a later date such as selective catheterization, may supply requisition form for signature.

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9. When informed by the radiologist that the radiographic examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

   a. May assist while radiologist removes connecting tubes, syringes, and/or catheter. Removes any markers from patient's body.

   b. May prepare to apply light pressure to venous puncture site when ordered. May prepare to apply pressure dressing to puncture site after manual pressure has been applied.

   c. Performer coordinates with anesthesiologist if present and/or other staff members responsible for recovery and after-care of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room.

   d. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders additional examination and/or delayed abdominal scout, or tests.

   e. Performer records the examination according to institutional procedures. May include date, room, examination type, the serial views taken, the technical factors used, and film sizes. May record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.

   f. Performer may record the fluoroscopic exposure including exposure time and rad dosage from posted data.

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g. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements. Makes sure that any non-disposable guide wires and catheters are cleaned and flushed immediately after use and before sterilization. h. Performer may return accessories such as computer control cards and immobilization devices to appropriate locations or has this done. i. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. j. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

TASK DESCRIPTION SHEET

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected,set for fluoroscopy;scout films taken;radiologist assisted with puncture,catheterization;pt. and equipment positioned,set up for automatic injection,single,stereo or biplane serial filming,subtraction;filming coordinated with injection;films sent for processing,radiologist's review;procedures repeated,continued as ordered;examination recorded;angiograms placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen;computer control panel,cable,keypunch cards;gowns, gloves,masks;technique,standard view,tube rating,rad exposure charts;phantom;x-ray generator(s),tube(s), control panel(s),extension cones;fluoroscopy unit, TV monitor,grid,image intensifier;cassettes;shielding;collimator(s);serial changer(s);tilt-table,radiolucent table top;stereo viewer;tourniquets;marking pen;R-L,ID device or markers;automatic injector;immobilization devices;tape;ECG equipment;emergency cart;sterile procedure tray for puncture,catheterization;antiseptic,saline,anticoagulant,local anesthetic,iodine based contrast,disinfectant solutions; swabs,drape,syringes;stretcher;wheelchair;calipers

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.;radiologist;anesthesiologist;nurse;co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking selective thyroid angiograms of any pt. by reviewing request;measuring,reassuring pt.;setting up for fluoroscopy,serial filming (single,stereo or biplane),subtraction,manual or automatic pressure injection;making scout films;assisting with sterile puncture,catheterization;identifying films;applying shielding;collimating;setting technical factors;positioning,immobilizing pt.;making serial films in coordination with injection;having films processed, reviewed;repeating,adjusting as ordered;placing angiograms for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a patient scheduled for selective thyroid angiography (contrast study of the thyroid and parathyroid glands, their arteries and veins, by means of selective catheterization) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s).

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for, the purpose and the areas involved.

      i) Notes area and side of interest, whether bilateral study is involved, recommended site for puncture.
      ii) Performer reads patient's name, identi-

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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fication number, sex, age, weight, and height. Notes whether patient is emergency patient.

- iii) Notes name of radiologist in charge, names of other staff members to assist, examination room, time scheduled.

b. Performer notes orders on equipment and materials:

- i) Notes type of serial film changer ordered, whether cassette, roll film, cut film, whether single or biplane, whether computer controlled, whether equipped with "see-through" top. Notes whether serial stereography is ordered, whether subtraction technique may be used. Notes type of table, whether angiography table or normal tilt-table. Notes whether patient will be moved from angiography table to changer, whether changer will be rolled under or beside table, or whether, with see-through changer, horizontal changer will be kept in place under table throughout procedure.
- ii) Notes whether general anesthesia is recommended, whether injection of contrast will be with automatic pressure injector or by hand. Notes type and amount of iodine based contrast solution. Notes whether ECG monitoring has been ordered.
- iii) Notes needle sizes and types, sizes, lengths and types of catheters and guide wires. Notes orders for saline, antiseptic, anticoagulant, anesthetic solutions.

c. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment, the examination ordered, and the area(s) of interest.

- i) May check that the type of equipment ordered is available in examination room assigned. If general anesthesia may be given, may check that x-ray equipment is compatible for use with anesthesia equipment.
- ii) Notes appropriate sterile procedures required, appropriate shielding for the examination.
- iii) Notes whether film processing equipment is available adjacent to procedure room.
- iv) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.

d. Performer notes relevant information about the patient's history and orders for prior preparation:

- i) Notes whether patient has prior history of allergic reaction to contrast or history of allergies. Notes whether allergy test has been ordered and, if so, results.
- ii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.
- iii) Depending on institutional procedures, performer may review

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patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether history of extensive radiography should be reported to radiologist. iv) Notes how patient will arrive for examination (whether in wheelchair, on stretcher, accompanied by staff, whether patient will be coherent, already sedated). v) Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as respiratory or heart disease, communicable or infectious condition, presence of IV drip, urinary catheter, behavioral disorder, incoherence. vi) Performer notes whether there are orders on prior preparation of patient such as therapeutic diet, allergy test, lab tests, cessation of oral contraceptive, prior abstinence from morning meal, cleansing enemas, catheterizing of bladder, start of IV drip, prior administration of sedation, tranquilizer, antihistamine, other medication, shaving of puncture site. Notes appropriate timing for medications to take effect. vii) Checks whether all procedures have been carried out and at appropriate time, and that all reports ordered are with patient's chart. If there is any problem, arranges to have procedures carried out, examination postponed to allow proper timing, reports problem to appropriate	staff member, or plans to inform radiologist. e. Depending on institutional procedures, notes whether performer is to set up equipment and/or prepare patient personally, or whether performer will join angiography team in examination room. f. If referring physician has requested that prior films, scans and test results already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have these delivered. g. If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to prepare properly, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders. 2. Performer prepares ahead so as not to keep patient in examination room longer than necessary. Determines what prior preparations will be needed, such as cleaning and preparation of equipment and accessories, proper dress. May carry out any or all of the following: a. Goes to appropriate room in the department for the type of examination involved and the equipment required, such as angiography suite, or room assigned on requisition sheet.

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b. May decide to clean x-ray equipment or arranges to have this done.

c. Washes hands as appropriate.

d. Reviews the technique chart(s) for the unit(s) to be used (single, stereo or biplane serial changer(s), fluoroscopy unit).

  i) Locates information for the areas of interest and views likely to be required. Takes note of the exposure factors to be used for overheads and fluoroscopy. Considers preferences of the radiologist involved, conversions needed to account for patient's age, condition, presence of contrast. Notes any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

  ii) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.

  iii) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

e. Checks for appropriate film supplies:

  i) With serial changer(s) using roll film, performer checks that

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there is an adequate supply for examination loaded in changer (s) and that film is properly loaded.

  ii) With serial changers using cassettes, and for scout films, performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Checks that these are loaded with appropriate speed and type of film and grid combinations depending on the patient's size, area of interest, techniques to be used, type of equipment, and institutional practices.

  iii) If adequate supply is not in room, arranges to obtain or decides to obtain personally.

  iv) Checks that equipment or device is available to number serial films, or checks that cassettes such as vacuum cassettes are prenumbered and are in numerical order.

  May prepare identification strip using tape and lead numerals giving appropriate ID information for placement on table or on cassette(s).

  May prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write out ID information on card if not received with requisition. Checks identification against requisition sheet.

  May place card as appropriate for use with automatic marking device

  v) Makes sure that right (R) and left (L) markers are available for use.

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f. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator(s) and checks that each indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for machine to "warm up." Makes sure that all circuits have been stabilized. If appropriate, checks each line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

g. Performer sets up and checks fluoroscopy equipment:

  i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.
  ii) Sets x-ray generator mode selector to fluoroscopy mode.
  iii) If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.
  iv) If appropriate, performer selects the proper field size selector (if there is dual image intensifier).
  v) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at the standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size

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and examination involved. Sets fluoroscopic examination timer to maximum position.
  vi) If a grid will be used with the image intensifier for fluoroscopy, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.
  vii) May adjust distance between focal spot and image intensifier (focal spot to film distance, FFD). May check that TOD is 15 inches or more.
  viii) Performer may collimate fluoroscopy tube depending on nature of the equipment and controls. May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or may set shutter mode selector to automatic collimation.
  ix) To check fluoroscopy mode (if not already done) places phantom or appropriate test object on radiography table where patient will be centered for examination.
  x) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest. If not already done, moves image intensifier into position; centers (over or under) the area of interest.
  xi) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate.

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- xii) Views test object being fluoroscoped on TV monitor. Adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly. Checks mA meter and notes whether appropriate reading is obtained.
- xiii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.
- xiv) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

h. Performer may set up and check serial changer(s) as appropriate to equipment:

  - i) As appropriate, sets x-ray mode selector(s) for overhead filming.
  - ii) Depending on the type of film changer(s) and examination table to be used, performer may wheel see-through horizontal changer into position under angiography table, may place changer so that patient may be moved to changer on radiolucent top after catheterization; may place changer so that it may be rolled under table after fluoroscopy. May set up changers as appropriate for stereo or biplane serial filming. May set up verticle changer for lateral filming.
  - iii) May cycle each unit to check operation. If so, makes sure that anode is not rotating.

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i. May set up and check automatic pressure injection equipment as appropriate to the type to be used (if any);makes sure it is grounded.

j. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

k. Performer notes whether ECG monitoring equipment (if ordered) and emergency cart is present. Notes who will be assigned to monitor.

l. May check that procedure tray for the examination has been properly prepared or decides to do personally.

  - i) Depending on radiologist's orders, checks for appropriate types and sizes of puncture needles, catheters, syringes, scalpels, guide wires, forceps, dressings. Notes whether appropriate antiseptic, saline, anticoagulant, and local anesthetic solutions are present.
  - ii) Checks that appropriate aqueous iodine based contrast solution is present. Checks that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool.

m. Checks that proper accessories are available for procedure:

  - i) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure, that appropriate shielding is available for placement between radiologist and the patient.

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ii) Checks that appropriate immobilization devices for adult or child and type of procedure are present.

iii) Checks that extension cones are available.

iv) Checks for hospital gowns, masks, gloves to be worn for sterile procedure.
May check for emesis basin and towels.

v) May set up footboard, shoulder rests, hand holds on tilt table.

3. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, any prior films, scans, and lab reports to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready:

   a. If performer is to prepare patient in procedure room, may proceed as follows:

      i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.

      ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room (wheeled on stretcher if patient has been sedated; escorted or carried if child or adult patient is to have general anesthesia after entering department).

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      iii) Performer greets a coherent patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet, referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

      iv) Has patient positioned or makes patient comfortable on examination table or on table-top over changer. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to table.
      If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.
      Performer may decide to assist patient to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.
      If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.
      May have nurse carefully place young patient in supine position on table, or lifts patient carefully, supporting patient's head, and places on table.

      v) Makes sure patient is being attended and there is no danger patient will fall off table.

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If patient has respiration, cardiac or infusion equipment or urinary catheter attached, makes sure that equipment is being monitored and is not dislodged.

vi) Checks that patient is in gown, with all jewelry removed; may check that patient is being kept warm.

vii) If not already done, questions patient or accompanying staff about any prior preparations and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

viii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

ix) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

x) Answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning or degree of coherence. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

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xi) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the body at the level(s) and in the direction(s) in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors. After measuring, has patient rest in as relaxed a position as possible.

b. Performer may inform attending radiologist when patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films and scans to radiologist. Displays radiographs on view boxes.

i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

ii) Performer may accompany radiologist to examination room, greet and/or introduce patient and staff members.

c. If not already done, performer joins radiologist, patient and other staff in examination room.

d. During radiologist's review of requisition, prior radiographic materials, and examination of patient, performer notes radiologist's orders:

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i) If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.

ii) Performer notes the radiologist' orders for scout film(s) including the patient position, projection, area of interest, centering and angulation. If biplane scouts are requested, notes whether alternating or simultaneous exposures are required. If stereo scouts are requested, notes angulation between tubes and direction of shift.

iii) May provide hospital gowns, gloves, mask for radiologist.

iv) Provides leaded apron and gloves to radiologist. Provides patient and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

4. Performer makes preliminary scout film(s) as ordered after making sure that patient is being attended. Sets up equipment for the examination before positioning and immobilizing patient:

   a. Performer may place single or biplane changer(s) in position for frontal and/or lateral or oblique projection(s) of the area of interest:

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i) May set changer(s) for manual control so that only one scout exposure will be made. If so, loads changer with appropriate cassette or operates film transport.

ii) For stereo scouts sets or checks angle between x-ray tubes as appropriate (8°).

iii) May select appropriate size cassette(s) and place in appropriate position(s) on table and/or in vertical cassette holder.

   b. Performer attaches appropriate identification information:

i) May place right or left marker on cassette as appropriate to the study and projection or depresses appropriate R or L button for automatic marking. May tape lead markers in position on patient's body in location indicated.

ii) May place identification information on appropriate corner of cassette; may set flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.
May place patient's card into card tray for equipment using automatic film marking device.

   c. Performer sets the technical factors for the first (or next) scout projection (of the first frontal and lateral projections for biplane scouts).

i) Performer selects the exposure factors for the preliminary scout projection(s) as describ-

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ed, taking account of the measurements taken of the patient.

ii) Sets control panel(s) for radiography mode and, as or if appropriate,for alternating shift for stereo exposures or simultaneous or alternating exposures for biplane equipment.

iii) For each projection selects milliamperage and chooses selectors for the correct focal size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

iv) Depending on the equipment, may set controls to provide for manual tableside adjustment of collimator, table and x-ray tube height and position (unless these have already been set).

v) Performer may set the focal-film distance(s) if not already done. Operates controls or manually moves the x-ray tube(s) into place. Checks each focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

d. Performer prepares patient for final positioning:

i) Depending on the positioning requested, performer prepares patient in prone or supine position on table over changer (or cassette).

ii) For lateral projection (single or biplane) makes sure that vertical changer (or cassette) is on the side of interest.

iii) Depending on patient's age and condition, performer may obtain

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help in positioning and immobilizing patient. May explain to staff member what is required.

iv) With patients that have balloon catheter or IV drip in place, performer is careful not to dislodge apparatus. Is alert to patient's respiration. Does not force patient into a position where any breathing difficulty increases. Does not force flexion of the neck.

e. For AP projection (posterior view) of neck and upper mediastinum,performer has patient lie in supine position over cassette or film changer.

i) Centers the median sagittal plane of the body to the midline, and adjusts the shoulders to lie on a single transverse plane.

ii) Extends the head slightly and adjusts so that its median sagittal plane is at right angles to the film. Immobilizes head.

iii) Centers film to include the neck and aortic arch or as directed.

iv) Directs central ray at right angles to the midpoint of the area of interest.

f. For prone PA projection (anterior view) of neck and upper mediastinum, performer has patient lie in prone position with head flexed over end of table and supported, or sitting facing film with head extended and supported.

i) Aligns body, shoulders and head as described for AP projection.

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ii) Centers film and directs central ray as described for AP projection at right angles to midpoint.

g. For lateral projection of neck and upper mediastinum, performer maintains patient in supine or prone position.

i) Places film in upright holder or changer at right angles to the horizontal (frontal) plane on the side of interest, as close as possible to the neck.
ii) Centers film to a coronal plane halfway between the manubrial notch and the midaxillary line, at the level of the center of the area of interest. Makes sure that median sagittal plane of head and body is parallel with plane of film.
iii) Directs central ray horizontally at right angles to midpoint of film.

h. For oblique projection of the neck and upper mediastinum, performer supports the patient's head (starting from prone or supine position as ordered).

i) Rotates head and shoulders and supports so that the side of interest is closest to the film and at the desired angulation.
ii) Centers film as appropriate to area of interest.
iii) Directs central ray at appropriate angle (or double angle) to the film as ordered.

i. If not yet completed, performer immobilizes patient in position:

i) Places restraining bands, strips of gauze, and adhesive tape as needed. May immobilize with head clamp, webbing strap under chin, or sponges.
ii) Elevates ankles or knees if appropriate; supports bony prominences. May place restraining bands across legs. May immobilize arms and hands.
iii) After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.
iv) Checks final positioning using light in collimator. Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows as reference for center of field, and uses the collimator light to center the tube to the part and/or film.
v) Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube to provide better centering.

j. Once the patient has been positioned and immobilized, performer adjusts the collimator so as to expose only the area of interest as defined by radiologist.

i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.
ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to fa-

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cilitate any further filming required.

k. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination.
Makes sure that anyone remaining in room is supplied with lead gloves and apron and stays out of central beam, especially horizontal beam.

l. Performer may rehearse coherent patient in breathing out and holding, or observes patient's breathing and plans exposure for the appropriate quiet phase such as after expiration.

m. Performer makes the exposure:

  i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.
  ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells patient when to breathe out as rehearsed and hold breath, or observes patient's breathing and times exposure to the appropriate quiet phase required.
  iii) Performer initiates exposure by pressing hand trigger or exposure control button (or appropriate control for stereo filming or simultaneous or alternating biplane exposure).
  iv) While exposure is underway, may check that mA meter records appropriate current as set, that kVp meter dips slightly.
  v) May watch for evidence of malfunction, such as line surge or

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excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
  vi) After exposure is completed, tells patient that he or she can relax. Returns to patient. Removes the cassette(s) or exposed film as appropriate for processing. Removes any markers on cassette(s) for further use.

n. If single plane scout films in both frontal and lateral projections are ordered (and if biplane equipment was not used), performer maintains patient in same position; proceeds with right angle projection and exposures as described, using appropriate technical factors. If appropriate and so ordered, proceeds with oblique scout projection as ordered.

o. Performer arranges to have the scout film(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

  i) While film(s) are being processed, makes sure that patient is comfortable and attended by staff person or self.
  ii) Performer brings the processed scout film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist when the radiograph(s) are ready. May place prior films for viewing as well.

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5. During radiologist's review of the scout film(s), performer notes radiologist's orders:

   a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.

   b. Performer notes whether radiologist requires a change in technical factors and/or patient positioning, centering, or central ray angulation for later serial filming.

      i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.

      ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

   c. If radiologist will proceed, notes radiologist's final orders on sequence of examination and use of contrast and equipment:

      i) Notes site of puncture, patient preparation needed such as medication, preparation of site. Notes whether general anesthesia will be administered.

      ii) Notes type and amount of contrast to be used, whether manually or automatically injected.

      iii) Notes final orders for types and sizes of needles, catheters, guide wire.

      iv) Notes number of injection sites, injections, projections, positions, anticipated and specific orders for first series. Notes whether serial stereography will be used, biplane seriography, whether subtraction technique will be used. With biplane filming notes whether exposures will be simultaneous or alternating.

      v) Notes orders for serial program(s),whether arterial, capillary and venous phases will be included. Notes the number of exposures and sequences, rate per second, and intervals between sequences.

      vi) If computer program(s) are to be used (giving the number of films to be taken, per second intervals, number of separate series, and possibly a program to coordinate with automatic pressure injection), performer arranges to have keypunch control card prepared or delivered and checked, or decides to do personally. When control card (s) are ready, performer places as appropriate in control panel of computer.

      vii) Discusses sequence and timing of procedure with radiologist. May arrange signals for operation of fluoroscopic exposure controls and/or for serial exposures.

6. Performer carries out preparations for angiography as ordered by radiologist based on the [illegible] of the work for which performer will be responsible. May carry out any or all of the following:

   a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or

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materials ordered by radiologist not already on tray. May assist in preparation of catheters, puncture needle, syringes containing saline solution, local anesthetic, anticoagulant, contrast solution. Notes or checks amounts ordered. Checks contrast for signs of chemical deterioration.

b. If performer will be responsible for filming, prepares ahead for fluoroscopy, automatic or hand injection (including computer controlled), and single plane, stereo, or biplane serial filming:

   i) May reset technical factors for fluoroscopy and/or serial filming based on radiologist's review of scout film(s) and the presence of contrast.

   ii) Sets programs for serial changer (s), automatic injector as appropriate. Checks that planned exposure time does not exceed available capacity of unit. For subtraction masks makes sure that program or settings allow for plain films to be taken for each view, followed by injection and serial films.

   iii) If not already done and computer program will be used, checks keypunch control card and places in computer control panel. Plugs synchronization cable from control unit into appropriate receptacle on the x-ray control panel.

   iv) Performer may load cassette changer(s) with proper number of vacuum or other type of cassettes as ordered.
   If appropriate, loads cut film changer or roll film changer.
   If the same cassette changer will be used for lateral and frontal projections, loads only enough cassettes for series in the first serial projection (to avoid artifact caused by shadow from last exposure in one position on the first cassette to be used in next position).
   If biplane changers are to be used, loads changers as appropriate for simultaneous or alternating exposures.

   v) Performer may set up equipment for automatic marking of films in numerical sequence or records cassette numbers for the sequence.

   vi) Depending on the equipment, performer may wheel serial changer (s) out of the way until fluoroscopy is completed; may make sure that everything is ready to lift patient from examination table on radiolucent table top to horizontal changer after fluoroscopy.

   vii) If automatic pressure injection is to be used, may attach tubing to syringe containing contrast solution using sterile technique. Attaches to machine and mounts syringe as appropriate. Checks that there are no air bubbles and that machine is on "stand-by."
   If automatic injection is not computer controlled, sets flowrate dial for the cc's per second as ordered by radiologist. When ordered by radiologist, sets pressure control as designated.

c. If performer is to assist with preparation of patient for catheterization, washes hands observing sterile technique when appropriate.

   i) If not already done, may arrange to have puncture site

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shaved and prepared (right and/or left femoral or axillary artery). Has patient lie in supine position.

ii) Positions patient for access to puncture site.
For femoral artery puncture, abducts patient's legs and exposes the femoral artery on the side to be punctured below the inguinal ligament as high as possible, but allowing for later compression proximal to puncture site.
For axillary artery puncture, has patient abduct arm on side to be punctured with arm bent. Provides access to area of the axilla.

iii) Immobilizes patient as appropriate. May adjust shoulder supports; may use wrist restraints.

iv) May swab puncture site area with antiseptic solution and cover surrounding area with sterile towels.

v) If appropriate, may make sure that ECG monitoring leads have been applied, or decides to do personally.

d. Makes sure that everyone to remain in room is properly shielded; may place lead screen in place if radiologist will inject contrast by hand.

e. May receive or obtain a clean hospital gown, cotton "boots," cap and mask. Dons these before approaching sterile area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids touching patient, drapes, radiologist, nurse, or instrument table with non-sterile object.

f. Informs radiologist when patient and materials are ready.

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g. If patient is to have general anesthesia, performer awaits signal that procedure can begin.

h. During injection of local anesthetic, puncture, placement of needle and advancing of catheter, performer assists as appropriate:

i) May hand materials and supplies asked for using sterile technique.

ii) May assist with fluoroscopic viewing of needle and progress of catheter placement. On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders. Continues as ordered.

iii) Performer may operate tilt table on orders from radiologist, or assists in positioning patient as ordered. Continues as ordered.

iv) May assist with attachment of syringes to flush catheter, inject contrast solution for fluoroscopic check of catheter placement.

v) Once catheter position is judged satisfactory, may tape into position maintaining sterile field.

vi) Repeats as appropriate for alternative site.

vii) With axillary route, performer may assist with application of tourniquet around arm, distal to the puncture site.

7. When the radiologist has advanced the catheter to the appropriate first location (aortic arch, right or left innominate or subclavian artery, or thyrocervical trunk) for filming of

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injection, performer coordinates with the radiologist as ordered:

a. May assist in positioning patient on table or over changer:

   i) May assist in moving patient on table top to horizontal changer.
   ii) May roll horizontal and/or biplane changer(s) into position under and/or beside angiography table.

b. Positions patient or assists radiologist in positioning for frontal, and/or lateral, or oblique views as described, for single plane, stereo or biplane exposures.
c. Performer checks that serial changer(s) are loaded, locked and ready. Centers and adjusts the x-ray tube angulation as appropriate. Centers film in changer(s) to the specified area of interest as ordered and collimates to the smallest possible exposure area. Checks patient's shielding.
d. Depending on whether injection is by hand or automatic, manually initiated or computer controlled, performer starts the automatic film changer(s) on the signal of the radiologist, or initiates the computer control of the injection and serial exposures at the control panel when ordered, allowing for plain films to be exposed for subtraction masks prior to injection.
e. If additional injections and exposures are required, such as right angle or oblique projections, and if biplane equipment has not been used, performer centers equipment as appropriate.

   i) Resets technical factors for the projections involved if required; repeats collimation, shielding and coordination of injection and making exposures as described.
   ii) If one single-plane changer is being used, reloads changer with cassettes or adjusts roll or cut film transport for additional serial projections. Sets up as described earlier.

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f. Removes tourniquet (if applied) when ordered.
g. Peformer has the exposed serial films processed at once or decides to do personally.

   i) Makes sure that serial films are numbered for appropriate order in sequence.
   ii) When the serial films have been processed, performer may place on view boxes with biplane views together and in appropriate serial order. Sets up stereo viewer if appropriate.
   iii) Notifies radiologist when angiograms are ready.

h. After processing, if radiologist indicates that subtraction prints are to be made, performer notes which post-injection radiographs (for each view) the radiologist wishes to utilize. Places the plain (pre-injection) film with the counterpart post-injection view(s) selected by radiologist.

   i) Makes out order for subtraction prints and takes to staff member who carries out this procedure. May present orders orally; may decide to prepare personally.
   ii) When subtraction prints are ready, performer places for viewing as described.

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iii) Repeats as appropriate if second order subtraction prints are ordered by radiologist.

i. Throughout procedure performer remains alert for any symptom of emergency or adverse reaction to contrast. As soon as performer judges that there is a reaction, performer notifies radiologist. May assist as appropriate with emergency care.

8. While radiologist reviews the first thyroid angiograms, performer notes radiologist's decisions on how to proceed with examination and orders for continuing:

   a. Performer notes whether initial injection will be repeated with a change in technical factors, amount of contrast, pressure and/or change in the projection made (such as lateral, oblique projections).
   b. Notes whether the catheter will be placed in the thyrocervical trunk, common carotid artery, and/or sequentially into the main branch arteries supplying the thyroid.

9. Performer continues with examination as ordered:

   a. For additional or repeat filming at the same injection site, performer notes orders for a change in amount of contrast, change in pressure setting for automatic injection, technical factors and/or the rate and speed for serial filming.

      i) Resets technical exposure factors, pressure settings, etc., as ordered and repeats appropriate steps.

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      ii) If radiologist orders additional views, performer makes any changes in x-ray tube position, angulation and/or position of serial changer and/or position of patient as appropriate.

   b. For additional injection sites, performer notes orders for change of catheter, location of new site. Notes orders on amount of contrast, use of manual or automatic injection, pressure setting, serial program, use of single, stereo or biplane seriography. Notes orders on positioning, centering, collimation.

      i) Performer assists as appropriate with fluoroscopy while radiologist replaces catheter with smaller one and/or advances catheter to next location. Assists with fluoroscopic check. May keep radiologist informed of cumulative exposure as shown on fluoroscope timer indicator.
      ii) Performer may assist in preparing appropriate amount of contrast for injection as ordered by radiologist.
      iii) Repeats set-up for single, stereo or biplane seriography, hand or automatic pressure injection as described earlier.
      iv) Selects and sets technical factors; sets program for seriography allowing for subtraction masks if requested and filming of appropriate phase, per-second intervals as ordered as described earlier.
      v) Positions table or helps position patient for supine, lateral and/or oblique projections as ordered.

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List Elements Fully	List Elements Fully
vi) Centers, collimates and shields as appropriate. vii) Repeats filming in coordination with injection as described. viii) Repeats processing of films and placement for review. Repeats steps for processing of subtraction prints as described. ix) As radiologist decides on additional branches to be entered and opacified, performer continues as ordered, as described. Adjusts positioning, centering, technical factors, pressure setting, amount of contrast, rate and speed of serial programs as ordered for each injection. Repeats as appropriate for each vessel to be opacified and awaits further orders. x) Performer shows subsequent sets of thyroid angiograms to radiologist as processed, and proceeds as described above until radiologist indicates that examination is completed. c. Performer may assist in emergency care of patient by placing tilt table on Trendelenburg position when ordered, assisting with injection of anticoagulant, or application of hot pads to avoid thrombic occlusion, as ordered. 10. When informed by the radiologist that the radiographic examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate: a. May assist while radiologist removes connecting tubes, syringes, and catheter. Removes any markers from patient's body. b. May prepare to apply pressure to arterial puncture site when ordered. May prepare to apply pressure dressing to puncture site after manual pressure has been applied.	c. Performer coordinates with anesthesiologist if present and/or other staff members responsible for recovery and after-care of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room. d. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders additional examination and/or delayed abdominal scout or tests. e. Performer records the examination according to institutional procedures. May include date, room, examination type, the serial views taken, the technical factors used, and film sizes. May record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet. f. May record the fluoroscopic exposure including exposure time and rad dosage from posted data. g. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements. Makes sure that any nondisposable guide wires and catheters are cleaned and flushed immediately after use and before sterilization. h. Performer may return accessories such as computer control cards and immobilization devices to appropriate locations or has this done.

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List Elements Fully	List Elements Fully
i. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or has this done, depending on institutional procedures. j. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

TASK DESCRIPTION SHEET

Task Code No. 515

This is page 1 of 19 for this task.

1. **What is the output of this task? (Be sure this is broad enough to be repeatable.)**

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected,set for fluoroscopy;scout films taken;radiologist assisted with arm-to-tongue test,puncture,catheterization,blood sampling;pt. and equipment positioned,set up for automatic injection,single or biplane seriography; filming coordinated with injection;films sent for processing,radiologist's review;procedures repeated, continued as ordered;examination recorded;angiograms placed for use.

2. **What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)**

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen;computer control panel,cable,keypunch cards;gowns,masks, gloves;technique,standard view,tube rating,rad exposure charts;phantom;x-ray generator(s),tube(s),control panel(s),extension cones;fluoroscopy unit,TV monitor,grid,image intensifier;cassettes;shielding; collimator(s);serial changer(s);tilt-table,radiolucent table top;R-L,ID device or markers;automatic injector;immobilization devices tape;ECG equipment; emergency cart;clock;manometer;IV equipment;sterile procedure tray with antiseptic,disinfectant,saline, anticoagulant,dextrose,Decholin,hippuran,PAH solutions,adrenal gland stimulant;test tubes,iced containers,syringes,swabs;scissors,gauze,pressure dressing,local anesthetic,Y-adaptor,needles,scalpels,guide wires,catheters,tourniquet;iodine-based contrast; drape;marking pen;calipers;stretcher;wheelchair

3. **Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )**

4. **If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.**

Non-infant pt.;radiologist(s);nurse;co-worker

5. **Name the task so that the answers to questions 1-4 are reflected.**

Taking catheter inferior vena cavograms and/or renal or adrenal venograms of non-infant pt. by reviewing request;measuring,reassuring pt.;setting up for fluoroscopy,single or biplane serial filming,manual or automatic injection;making scout film(s);assisting with arm-to-tongue test,sterile puncture,catheterization,blood sampling;identifying films;applying shielding;collimating;setting technical factors;positioning,immobilizing pt.;making serial films in coordination with injection;having films processed,reviewed;repeating,adjusting,continuing as ordered; placing angiograms for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a non-infant patient scheduled for catheter inferior vena cavography and/or selective renal or adrenal venography (contrast study of inferior vena cava, and/or renal or adrenal veins by means of selective catheterization) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s).

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

    a. Performer checks the examination called for, the purpose and the areas involved:

        1) Notes whether inferior vena cavography is ordered, whether interest is in renal or adrenal veins, whether inferior

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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vena cavography will precede selective renal or adrenal venography.

- ii) Notes whether sampling of renal venous blood is requested (renal vein renin study), whether there will be sampling of adrenal venous blood.
- iii) Notes whether bilateral catheterization is suggested, whether simultaneous or sequential.
- iv) Notes suggested puncture site(s).
- v) Notes whether arm-to-tongue circulation time will be tested during procedure.

b. Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is emergency patient.

c. Notes name of radiologist in charge, names of other staff members to assist, examination room, time scheduled.

d. Performer notes orders on equipment and materials:

- i) Notes type of serial film changer ordered, whether cassette, roll film, cut film, whether single or biplane, whether computer controlled, whether equipped with "see-through" top. Notes type of table, whether angiography table, normal tilt-table or rotating table. Notes whether patient will be moved from angiography table to changer, whether changer will be rolled under or beside table, or whether, with see-through changer, horizontal changer will be kept in place under table throughout procedure.
- ii) Notes type of iodine based contrast solution ordered, whether automatic or hand injection has been selected.

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- iii) Notes orders on sizes and lengths of catheters, whether j-shaped, preformed, closed or open ended, with side holes, whether radiopaque, whether with deflector assembly. Notes orders on type of safety guide wires, types and sizes of needles.
- iv) Notes orders for type and amount of antiseptic, anticoagulant, local anesthetic, saline solutions.
- v) Depending on the purpose of the examination and procedures, notes orders for dextrose solution, Decholin (for arm-to-tongue test), hippuran, PAH solution (for renal vein renin study), specific adrenal gland stimulant, test tubes, iced blood sample containers, vacutainers, venatubes, IV apparatus.
- vi) Notes whether ECG monitoring equipment, manometer to check venous pressure have been ordered. Notes staff assigned to monitor equipment and/or assist with bilateral sampling.

e. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment, the examination ordered, and the area of interest.

- i) May check that the type of equipment ordered is available in examination room assigned.
- ii) Notes appropriate sterile procedures required, appropriate shielding for the examination.

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iii) Notes whether film processing equipment is available adjacent to procedure room.

iv) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.

f. Performer notes relevant information about the patient's history and orders for prior preparation:

i) Notes whether patient has prior history of allergic reaction to contrast or history of allergies. Notes whether allergy test has been ordered and, if so, results.

ii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.

iii) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether history of extensive radiography should be reported to radiologist.

iv) Notes how patient will arrive for examination (whether in wheelchair, on stretcher, accompanied by staff,whether patient will be coherent, already sedated).

v) Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as respiratory

List Elements Fully

or heart disease, communicable or infectious condition, presence of IV drip, urinary catheter, behavioral disorder, incoherence.

vi) Performer notes whether there are orders on prior preparation of patient such as therapeutic diet, allergy test, lab tests, cessation of oral contraceptive, prior abstinence from morning meal, cleansing enemas, catheterizing of bladder, start of IV drip, prior administration of sedation, tranquilizer, antihistamine, other medication, shaving of puncture site (s). Notes appropriate timing for medications to take effect.

vii) Checks whether all procedures have been carried out and at appropriate time and that all reports ordered are with patient's chart. If there is any problem, arranges to have procedures carried out, examination postponed to allow proper timing, reports problem to appropriate staff member, or plans to inform radiologist.

g. Depending on institutional procedures, notes whether performer is to set up equipment and/or prepare patient personally, or whether performer will join angiography team in examination room.

h. If referring physician has requested that prior films, ultrasonograms, scans and test results already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have these delivered.

i. If the performer determines that the request is not properly auth-

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orized, is incomplete, that sufficient information is lacking for performer to prepare properly, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

2. Performer prepares ahead so as not to keep patient in examination room longer than necessary. Determines what prior preparations will be needed, such as cleaning and preparation of equipment and accessories, proper dress. May carry out any or all of the following:

   a. Goes to appropriate room in the department for the type of examination involved and the equipment required, such as angiography suite, or room assigned on requisition sheet.
   b. May decide to clean x-ray equipment or arranges to have this done.
   c. Washes hands as appropriate.
   d. Reviews the technique chart(s) for the unit(s) to be used (single or biplane serial changer(s), fluoroscopy unit).

      i) Locates information for the areas of interest and views likely to be required. Takes note of the exposure factors to be used for overheads and fluoroscopy. Considers preferences of the radiologist involved, conversions needed to account for patient's age, condition, presence of con-

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trast. Notes any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

      ii) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.
      iii) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

   e. Checks for appropriate film supplies:

      i) With serial changer(s) using roll film, performer checks that there is an adequate supply for examination loaded in changer(s) and that film is properly loaded.
      ii) With serial changers using cassettes, and for scout films, performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Checks that these are loaded with appropriate speed and type of film and grid combinations depending on the patient's size and area of interest, the type of equipment

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to be used, and institutional practices.

iii) If adequate supply is not in room, arranges to obtain or decides to obtain personally.

iv) Checks that equipment or device is available to number serial films, or checks that cassettes such as vacuum cassettes are prenumbered and are in numerical order.
May prepare identification strip using tape and lead numerals giving appropriate ID information for placement on table or on cassette(s).
May prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write out ID information on card if not received with requisition. Checks identification against requisition sheet.
May place card as appropriate for use with automatic marking device.

v) Makes sure that right (R) and left (L) markers are available for use.

f. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator(s) and checks that each indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for machine(s) to "warm up." Makes sure that all circuits have been stabilized. If appropriate, checks each line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

g. Performer sets up and checks fluoroscopy equipment:

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i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.

ii) Sets x-ray generator mode selector to fluoroscopy mode.

iii) If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

iv) If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

v) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position.

vi) If a grid will be used with the image intensifier for fluoroscopy, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

vii) May adjust distance between focal spot and image intensifier (focal spot to film dis-

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tance, FFD). May check that TOD is 15 inches or more.

viii) Performer may collimate fluoroscopy tube depending on nature of the equipment and controls. May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or may set shutter mode selector to automatic collimation.

ix) To check fluoroscopy mode (if not already done) places phantom or appropriate test object on radiography table where patient will be centered for examination.

x) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest. If not already done, moves image intensifier into position; centers (over or under) the area of interest.

xi) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate.

xii) Views test object being fluoroscoped on TV monitor. Adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly. Checks mA meter and notes whether appropriate reading is obtained.

xiv) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

h. Performer may set up and check serial changer(s) as appropriate to equipment:

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i) As appropriate, sets x-ray mode selector(s) for overhead filming.

ii) Depending on the type of film changer(s) and examination table to be used, performer may wheel see-through horizontal changer into position under angiography table, may place changer so that patient may be moved to changer on radiolucent top after catheterization, or may place changer so that it may be placed under table after fluoroscopy. May set up changer in vertical position next to table for lateral filming, or may roll equipment out of way.

iii) May cycle each unit to check operation. If so, makes sure that anode is not rotating.

i. May set up and check automatic pressure injection equipment as appropriate to the type to be used (if any). Makes sure it is grounded.

j. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

k. Performer notes whether ECG monitoring equipment (if ordered), manometer, and emergency cart are present. Notes who will be assigned to monitor.

l. May check that procedure tray for the examination has been properly prepared or decides to do personally:

i) Depending on radiologist's orders, checks for appropriate types and sizes of puncture needles, catheters, syringes, scalpels, guide wires, forceps, dressings. Notes whether appropriate antiseptic, saline, anti-

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coagulant, and local anesthetic solutions are present.

ii) If arm-to-tongue circulation test is to be done, checks for presence of Decholin and injection equipment. If blood sampling will be done, checks for appropriate test solutions and medications as ordered. Checks for IV apparatus, tourniquets, iced blood sample containers, labels.

iii) Checks that appropriate aqueous iodine based contrast solution is present. Checks that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool.

m. Checks that proper accessories are available for procedure:

i) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure, that appropriate shielding is available for placement between radiologist and the patient.

ii) Checks that appropriate immobilization devices for adult or child are present.

iii) Checks that extension cones are available.

iv) Checks for hospital gowns, masks, gloves to be worn for sterile procedure. May check for emesis basin and towels.

v) May set up footboard, shoulder rests, hand holds on tilt table.

3. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, any prior films, scans, and lab reports to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready:

a. If performer is to prepare patient in procedure room, may proceed as follows:

i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.

ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room (wheeled on stretcher if patient has been sedated).

iii) Performer greets a coherent patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet, referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

iv) Has patient positioned or makes patient comfortable on examination table or on table-top over AP changer. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to table.

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If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.

Performer may decide to assist patient to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.

If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.

v) Makes sure patient is being attended and there is no danger patient will fall off table.

If patient has respiration, cardiac or infusion equipment or urinary catheter attached, makes sure that equipment is being monitored and is not dislodged.

vi) Checks that patient is in gown, with all jewelry removed; may check that patient is being kept warm.

vii) If not already done, questions patient or accompanying staff member about any prior preparations and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

viii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

ix) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in

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charge at once; proceeds only with approval.

x) Answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior.

Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning or degree of coherence. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

xi) Notes the patient's body type, whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points will be easy to find.

xii) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the body at the level(s) and in the direction(s) in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors. After measuring, has patient rest in as relaxed a position as possible.

b. Performer may inform attending radiologist when patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films and scans to radiologist. Displays radiographs on view boxes.

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  i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

  ii) Performer may accompany radiologist to examination room, greet and/or introduce patient and staff members.

c. If not already done, performer joins radiologist, patient and other staff in examination room.

d. During radiologist's review of requisition, prior radiographic materials, and examination of patient, performer notes radiologist's orders:

  i) If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.

  ii) If radiologist decides to proceed, performer notes the radiologist's orders for scout film(s) including the patient position, projection, area of interest, centering and phase of suspended respiration. If biplane scouts are requested, notes whether alternating or simultaneous exposure is required.

  iii) May provide hospital gown, gloves, mask to radiologist.

  iv) Provides leaded apron and gloves to radiologist. Provides patient and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

4. Performer makes preliminary scout film(s) as ordered after making sure that patient is being attended. Sets up equipment for the examination before positioning and immobilizing patient:

a. Performer may place single or biplane changer(s) in position for AP and/or lateral projection(s) of the abdomen:

  i) May set changer(s) for manual control so that only one scout exposure will be made. If so, loads changer(s) with appropriate cassette or operates film transport.

  ii) May select appropriate size cassette(s) and place in appropriate position(s) on table or in vertical cassette holder.

b. Performer attaches appropriate identification information:

  i) May place right or left marker on cassette as appropriate to the study and projection or depresses appropriate R or L button for automatic marking. May tape R or L marker to patient's body.

  ii) May place identification information on appropriate corner of cassette; may set flashcard aside for later use with space

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created by piece of leaded rubber on appropriate edge of cassette; may place patient's card into card tray for equipment using automatic film marking device.

c. Performer sets the technical exposure factors for the first (or next) scout projection (or AP and lateral projections for biplane scouts):

   i) Performer selects the exposure factors for the preliminary scout projection(s) as described, taking account of the measurements taken of the patient.
   ii) Sets control panel(s) for radiography mode and, as or if appropriate, for simultaneous or alternating exposures for biplane equipment.
   iii) For each projection selects milliamperage and chooses selectors for the correct focal size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.
   iv) Depending on the equipment, may set controls to provide for manual tableside adjustment of collimator, table and x-ray tube height and position (unless these have already been set).
   v) Performer may set the focal-film distance(s) if not already done. Operates controls or manually moves the x-ray tube(s) into place. Checks each focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

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d. Performer prepares patient for final positioning:

   i) Places patient in supine position on table over changer (or cassette). Arranges patient so that median sagittal plane of body is centered to midline.
   ii) For single or biplane lateral projection plans to maintain patient in supine position. Positions vertical changer (or cassette in vertical holder) at right angles to table on the side of interest.
   iii) Depending on patient's age and condition, may obtain help in positioning and immobilizing patient. May explain to staff member what is required.
   iv) If patient has a balloon catheter or IV drip in place, is careful not to dislodge apparatus. Makes sure that no radiopaque part is lying over an area to be exposed, or that patient is not lying on a clamp.

e. For projections of the abdomen, performer may position as follows:

   i) Elevates supine patient's shoulders and knees so that patient's back is in contact with table. Supports. Adjusts shoulders and hips so that they lie on single transverse planes. May immobilize ankles. May have patient flex elbows and abduct arms. May place restraining band across legs.
   ii) For an AP projection (posterior view) of abdominal contents, performer centers to the level of the iliac crests unless otherwise specified. Makes sure

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not to use visual points of muscle or fatty tissue and palpates for the crest of the symphysis pubis. Directs central ray vertically at right angles to film to midpoint of area of interest.

iii) For a lateral projection with patient supine, centers film in vertical changer or cassette in vertical holder to the mid-axillary line of the body at the level of the center of the area of interest. Directs central ray horizontally at right angles to film, centered to the area of interest.

f. If not yet completed, immobilizes patient in position.

i) Places restraining bands, strips of gauze, and adhesive tape as needed. Avoids use of compression band across abdomen. May immobilize arms.

ii) May check that there is no rotation of pelvis by measuring the distance from the anterior superior iliac spine to table top on each side. Overcomes rotation of pelvis due to swelling or atrophy by elevating appropriate side.

iii) After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

iv) Checks final positioning using light in collimator. Activates the collimator light and points the light beam towards the part. Uses crosshair shadows as reference for center of field, and uses the collimator light to center the tube to the part and/or film.

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v) Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube to provide better centering.

g. Once the patient has been positioned and immobilized, performer adjusts the collimator so as to expose only the area of interest as defined by radiologist.

i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimize size needed to cover the area of interest.

ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

h. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination. Makes sure that anyone remaining in room is supplied with lead gloves and apron and stays out of central beam, especially horizontal beam.

i. Performer may rehearse coherent patient in breathing out and holding or breathing in and holding, depending on orders, or observes patient's breathing and plans exposure for the appropriate quiet phase such as after expiration.

j. Performer makes the exposure:

i) Observes the patient's movement until the moment that the expo-

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sure is made. Readjusts position if warranted.

  - ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells patient when to hold breath as rehearsed or observes patient's breathing and times exposure to the appropriate quiet phase required.
  - iii) Performer initiates exposure by pressing hand trigger or exposure control button (or appropriate control for simultaneous or alternating biplane exposure).
  - iv) While exposure is underway, may check that mA meter records appropriate current as set, that kVp meter dips slightly.
  - v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
  - vi) After exposure is completed, tells patient that he or she can relax. Returns to patient. Removes the cassette(s) or exposed film as appropriate for processing. Removes any markers from cassette(s) for further use.

k. If single plane scout films in both AP and lateral projections are ordered (and if biplane equipment was not used), performer maintains patient in same position; proceeds with right angle projection as described, using appropriate technical factors.

l. Performer arranges to have the scout film(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

  - i) While film(s) are being processed, makes sure that patient is comfortable and attended by staff person or self.
  - ii) Performer brings the processed scout film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist when the radiograph(s) are ready. May place prior films for viewing as well.

5. During radiologist's review of the scout film(s) performer notes radiologist's decisions and orders on how to proceed:

a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.

b. If radiologist decides that additional preparatory steps are needed, performer may arrange to have these carried out and/or performer arranges to reschedule patient.

c. Performer notes whether radiologist requires a change in technical factors and/or patient positioning, centering, or central ray angulation for later serial filming.

  - i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.
  - ii) Notes whether any problem with technique is due to performer's

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own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

d. If radiologist will proceed, notes orders on sequence of examination:

   i) Notes whether arm-to-tongue circulation time will be tested so that program for seriography can be ordered.
   ii) Notes final choice of puncture site(s), whether bilateral catheterization will be done, and, if so, whether simultaneous with assistant to help, or sequential.
   iii) Notes orders for preparation of patient such as sedation, preparation of site(s).
   iv) Notes orders for timing of IV infusion for renal vein renin study or injection of gland stimulant for adrenal vein study. Notes timing for blood sampling including control samples.
   v) Notes sequence of injections planned, whether inferior vena cavography or selective renal venography or adrenal venography will be done first.
   vi) May note when venous pressure will be taken.
   vii) Notes final orders on sizes, types and amounts of materials; notes final orders on use of hand or automatic pressure injection, single or biplane seriography, and, if biplane, whether simultaneous or alternating exposures.
   viii) Discusses sequence and timing of procedure and assignment of duties if not already done. May arrange signals for operation of fluoroscopic exposure controls and/or serial exposures.

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6. If performer will assist with arm-to-tongue circulation time test, and/or will receive orders on programs for seriography based on results, may do any or all of the following:

   a. Performer may assist with test:

      i) May position patient in supine position with appropriate arm extended so as to expose the antecubital venous site for injection.
      ii) May tape arm to pad or arm board in extended position. May assist with application and removal of tourniquet.
      iii) If not already done, may decide to prepare syringe with Decholin.
      iv) May swab entry site with antiseptic solution.
      v) May note or check time elapse from moment of injection to patient's report of bitter taste. May record as dictated or noted.

   b. Peformer notes the radiologist's orders for the seriography to visualize the desired circulatory phases so areas of interest will be exposed as they are opacified.

      i) Performer notes the number of exposures and sequences, rate per second, and intervals between sequences. Notes number of injections such as one for AP, one for lateral projection, unless biplane equipment will be used. Notes phase of respiration for exposure.

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ii) If computer program(s) are to be used (giving the number of films to be taken, per second intervals, number of separate series, and possibly a program to co-ordinate with automatic pressure injection), performer arranges to have keypunch control card prepared or delivered and checked, or decides to do personally. When control card(s) are ready, performer places as appropriate in control panel of computer.

7. Performer carries out preparations for angiography as ordered by radiologist based on the part of the work for which performer will be responsible. May carry out any or all of the following:

a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray using sterile technique.

i) May assist in preparation of catheters, puncture needle, syringes containing saline solution, local anesthetic, anticoagulant, contrast solution. Notes or checks amounts ordered. Checks contrast for signs of chemical deterioration.
ii) May be asked to assist with preparation of IV bottle of radioactive hippuran and PAH (for renal vein renin study). May set up IV infusion apparatus. Attaches bottle of prepared solution to sterile IV tubing. Hangs at appropriate height on pole near patient with clamp in closed position.

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iii) May be asked to assist with preparation of syringe with adrenal gland stimulant.
iv) May be asked to assist with preparation of labels and containers for blood samples.
v) Arranges to carry out appropriate steps at proper time or when ordered.

b. If performer will be responsible for filming, prepares ahead for fluoroscopy, automatic or hand injection (including computer controlled), and serial filming (single or biplane):

i) May reset technical factors for fluoroscopy and serial filming based on radiologist's review of scout film(s) and the presence of contrast.
ii) Depending on equipment, performer may wheel serial changer(s) out of the way until fluoroscopy is completed; may make sure that everything is ready to lift patient from examination table on radiolucent table top to horizontal changer after fluoroscopy.
iii) Sets programs for serial changer(s), automatic injector as appropriate. Checks that planned exposure time does not exceed available capacity of unit. If not already done and computer program will be used, checks keypunch control card and places in computer control panel.
iv) Performer may load cassette changer(s) with proper number of vacuum or other type of cassettes as ordered. (If appropriate, loads cut film changer or roll film changer.) If the

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same cassette changer will be used for lateral and AP projections, loads only enough cassettes for series in the first projection (to avoid artifact caused by shadow from last exposure in one position on the first cassette to be used in next position).

v) If biplane changers are to be used, loads changers as appropriate for simultaneous or alternating exposures.

vi) For computer controlled seriography, plugs synchronization cable from control unit into appropriate receptacle on the x-ray control panel.

vii) May set up equipment for automatic marking of films in numerical sequence or records cassette numbers for the sequence.

viii) If automatic pressure injection is to be used, may attach tubing to syringe(s) containing contrast solution using sterile technique. Attaches to machine and mounts syringe(s) as appropriate. Checks that there are no air bubbles and that machine is on "stand-by." If automatic injection is not computer controlled, sets flow-rate dial for the cc's per second as ordered by radiologist. When ordered by radiologist,sets pressure control as designated.

c. If performer is to assist with preparation of patient for blood sampling and/or catheterization, may do any or all of the following:

i) Washes hands observing sterile technique when appropriate.

ii) If not already done, may arrange to have puncture site(s) shaved and prepared, and allows time for any prior medication to take effect.

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iii) At appropriate time, depending on the nature of the blood sampling tests, performer may assist with IV infusion. Prepares patient for insertion of IV needle, if not already done, by exposing antecubital vein selected, applying tourniquet if ordered, and swabbing site with antiseptic solution. After needle is inserted, may remove tourniquet; may tape needle into place; may immobilize arm on pad or arm board. May periodically check that needle has not become dislodged and that the fluid is dripping at an even rate. May check timing and notify radiologist after a proper amount of infusion time has elapsed.

d. If performer is to assist with preparation of patient for puncture, positions patient in supine position on table.

i) Abducts patient's legs and exposes the femoral vein(s) on the side(s) to be punctured just below the inguinal ligament. May rotate thighs externally and immobilize.

ii) May adjust shoulder supports and use wrist restraints.

iii) May swab puncture site area(s) with antiseptic solution and cover surrounding area with sterile towels.

iv) If appropriate, may make sure that ECG monitoring leads have been applied, or decides to do personally. Makes sure that someone is assigned to take venous pressure readings if appropriate.

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e. Makes sure that everyone to remain in room is properly shielded; may place lead screen in place if radiologist will inject contrast by hand.

f. May receive or obtain a clean hospital gown, cotton "boots," cap and mask. Dons these before approaching sterile area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids touching patient, drapes, radiologist, nurse, or instrument table with non-sterile object.

g. Informs radiologist when patient and materials are ready.

h. During injection of local anesthetic, puncture, placement of needle and advancing of catheter, performer assists as appropriate:

  i) May hand materials and supplies asked for using sterile technique.

  ii) May assist with fluoroscopic viewing of needle and progress of catheter placement. On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders. Continues as ordered.

  iii) Performer may operate tilt table on orders from radiologist, or assist in positioning patient as ordered. Continues as ordered.

  iv) May assist with attachment of syringes to flush catheter(s) and to inject contrast solution for fluoroscopic check of catheter placement.

  v) Repeats as appropriate for bilateral catheterization.

  vi) Assists with fluoroscopic check of catheter placement(s) (at the level of the first lumbar vertebra for inferior vena cavography; within inferior vena cava at the level of the first lumbar vertebra for right renal vein; and/or at first or second lumbar intervertebral space for left renal vein; at the level of the twelfth vertebra above right renal vein for the right adrenal vein; and within left renal vein for left adrenal vein).

  vii) Once catheter position(s) is (are) judged satisfactory, may tape into position, maintaining sterile field.

  viii) May assist with attachment of manometer and recording of venous pressure as directed.

i. Performer may stand by or assist with labeling as adrenal vein blood samples are taken prior to injection of adrenal gland stimulant. May prepare injection site as described earlier.

j. At appropriate time, performer may assist with covering and labeling of adrenal or renal vein blood samples.

  i) Makes sure that containers show time and the specific side from which sample was taken. Makes sure test tubes or vacutainers are placed in iced containers.

  ii) If comparison blood samples are to be taken from a peripheral arm vein, may prepare site as described earlier. Assists as described.

8. At appropriate time, when indicated by radiologist, performer assists and coordinates filming with injection of contrast:

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a. May assist in positioning patient on table or over changer:

  1) May assist in moving patient on table top to horizontal changer.
  ii) May roll horizontal and/or biplane changer(s) into position under and/or beside angiography table.

b. Positions patient or assists radiologist in positioning:

  1) Performer positions patient in supine position as described and sets up for AP and/or lateral projections depending on whether biplane equipment will be used.
  ii) If oblique projections are ordered, performer positions table or elevates patient's side opposite the area of interest to the angulation ordered.
  iii) Collimates to the area of interest as indicated by radiologist.

c. Performer reviews and checks pressure settings, amount of contrast, serial program.

  1) May help attach "Y" adaptor to catheters for bilateral injection.
  ii) May assist with disconnecting of catheter(s) from IV tubing and attaching to pressure injection syringe(s) containing contrast solution.

d. Performer checks that serial changer(s) are loaded, locked and ready. Centers and adjusts the x-ray tube (s) angulation as appropriate. Centers film in changer(s) to the specified area of interest as described, and collimates to the smallest possible exposure area. Checks patient's shielding.

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e. Depending on whether injection is by hand or automatic, manually initiated or computer controlled, performer starts the automatic film changer(s) on the signal of the radiologist, or initiates the computer control of the injection and serial exposures at the control panel when ordered.

f. If additional injections and exposures are required, such as right angle or oblique projections, and if biplane equipment is not being used, performer centers equipment as appropriate.

  1) Resets technical factors for the projections involved if required, repeats collimation, shielding, and coordination of injection and making exposures as described.
  ii) If one single plane changer is being used, reloads changer with cassettes or adjusts roll or cut film transport for additional serial projections. Sets up as described earlier.

g. Performer has the serial films processed at once or decides to do personally:

  1) Makes sure that serial films are numbered for appropriate order in sequence.
  ii) When the serial films have been processed, performer may place on view boxes with biplane views together and in appropriate serial order. Notifies radiologist when they are ready.

h. Throughout procedure performer remains alert for any symptom of emergency or adverse reaction to contrast. As soon as performer judges that there is a reaction,

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performer notifies radiologist. May assist as appropriate with emergency care:

- i) May place tilt table in Trendelenburg position when ordered.
- ii) May assist with injection of anticoagulant as ordered.
- iii) May assist with application of hot packs to avoid thrombotic occlusion as ordered.

9. While the radiologist reviews the first inferior vena cavograms or renal or adrenal venograms, performer notes radiologist's decisions on how to proceed with examination and orders for any continuation:

   a. Performer notes whether the initial injection will be repeated with a change in technical factors, amount of contrast, pressure, and/or change in position, such as oblique projections.
   b. Performer notes, if first series were of the inferior vena cava, whether selective catheterization of the renal or adrenal veins will be done, whether bilateral or unilateral.
   c. If unilateral catheterization has been done, performer notes whether opposite side opacification of renal or adrenal vein will be carried out.

10. Performer continues with examination as ordered:

   a. For additional or repeat filming at the same injection site, performer notes orders for a change in amount of contrast, pressure setting, technical factors, and/or rate and speed for serial filming.

List Elements Fully

- i) Resets technical exposure factors, pressure settings, etc., as ordered and repeats appropriate steps.
- ii) If radiologist orders additional views, performer makes any changes in x-ray tube position, angulation and/or position of serial changer and/or position of patient as appropriate.

   b. For bilateral catheterization, performer repeats appropriate steps as radiologist repeats puncture on opposite side or withdraws catheter from initial site and places in position for opposite side injection. Repeats appropriate steps for opposite side filming, processing and review.
   c. For bilateral catheterization or for selective renal or adrenal catheterization, performer notes orders on how to proceed.

- i) May assist as appropriate with fluoroscopy while radiologist replaces catheter with one of different shape or size and advances to next location.
- ii) May keep radiologist informed of cumulative exposure as shown on fluoroscopic timer indicator.
- iii) May assist in preparing appropriate amount of contrast for injection as ordered by radiologist.
- iv) Repeats set-up for single or biplane seriography, hand or pressure injection as described. Helps position patient. Selects and sets technical factors, program for seriography,

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collimates and provides shielding as appropriate and/or as ordered.

- v) Repeats filming in coordination with injection as described, and repeats processing of films and placement for review.
- vi) Performer continues as ordered for each injection series for each vessel to be opacified. Shows subsequent sets of angiograms to radiologist as processed, and proceeds as described above until radiologist indicates that examination is completed.

11. When informed by the radiologist that the radiographic examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

    a. May assist while radiologist removes connecting IV equipment, tubes, syringes, and catheter(s). Removes any markers from patient's body.
    b. May prepare to apply pressure to venous puncture site(s) when ordered. May prepare to apply pressure dressing to puncture site(s) after manual pressure has been applied.
    c. Performer coordinates with the staff members responsible for recovery and after-care of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room.
    d. May check that blood samples have been prepared for laboratory, are properly identified and iced, or decides to do personally. May present lab. order form to radiologist for signature.

List Elements Fully

    e. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders additional examination and/or delayed abdominal scout or tests.
    f. Performer records the examination according to institutional procedures. May include data, room, examination type, the serial views taken, the technical factors used, and film sizes. May record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.
    g. May record the fluoroscopic exposure including exposure time and rad dosage from posted data.
    h. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements. Makes sure that any nondisposable guide wires and catheters are cleaned and flushed immediately after use and before sterilization.
    i. Performer may return accessories such as computer control cards and immobilization devices to appropriate locations or has this done.
    j. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or has this done, depending on institutional procedures.
    k. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

TASK DESCRIPTION SHEET

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected, set for fluoroscopy;scout films taken;radiologist assisted with puncture,fluoroscopy;pt. and equipment positioned, set up for serial filming;exposures coordinated with injection;films sent for processing,radiologist's review;procedures repeated,continued as ordered;examination recorded;angiograms placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen; computer control panel,cable,keypunch cards;gowns, gloves,masks;technique,standard view,tube rating,rad exposure charts;phantom;x-ray generator(s),tube(s), control panel(s),extension cones;fluoroscopy unit, TV monitor,grid,image intensifier;cassettes;shielding;collimator(s);serial changer(s);tilt-table,radiolucent table top;R-L,ID device or markers;immobilization devices;manometer;tape;ECG equipment;emergency cart;sterile procedure tray for puncture;antiseptic,saline,anticoagulant,local anesthetic,iodine based contrast,disinfectant solutions;swabs, drape,syringes;marking pen;wheelchair;calipers

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.;radiologist;anesthesiologist;nurse;co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking percutaneous splenoportograms of any pt. by reviewing request;measuring,reassuring pt.;setting up for fluoroscopy,serial filming;making scout films; assisting with sterile puncture,fluoroscopy;identifying films;applying shielding;collimating;setting technical factors;positioning,immobilizing pt.; making serial films in coordination with injection; having films processed,reviewed;repeating,adjusting as ordered;placing splenoportograms for use; recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card,and any appropriate medical-technical history for a patient scheduled for splenoportography (contrast study of the spleen and the splenic, portal and hepatic veins after percutaneous needle injection of contrast into the body of the spleen) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s), such as arterial portographs, selective celiac angiograms.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for, the purpose and the area involved.
   b. Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is emergency patient.

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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c. Notes name of radiologist in charge, names of other staff members to assist, examination room, time scheduled.

d. Performer notes orders on equipment and materials:

  i) Notes type of serial film changer ordered, whether cassette, roll film, cut film, whether computer controlled, whether equipped with "see-through" top. Notes type of table, whether angiography table, normal tilt-table. Notes whether patient will be moved from angiography table to changer, whether changer will be rolled under or beside table, or whether see-through changer will be kept in place under table throughout procedure.

  ii) Notes type and amount of iodine based contrast solution ordered, type and amount of antiseptic, anticoagulant, local anesthetic, saline solutions ordered, type and size of puncture needle required.

  iii) Notes whether general anesthesia has been suggested.

  iv) Notes whether ECG monitoring equipment, manometer to check splenic pressure have been ordered.

e. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment, and the examination ordered.

  i) May check that the type of equipment ordered is available in examination room assigned. If general anesthesia may be given, may check that x-ray equipment is compatible for use with anesthesia equipment.

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  ii) Notes appropriate sterile procedures required, appropriate shielding for the examination.

  iii) Notes whether film processing equipment is available adjacent to procedure room.

  iv) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.

f. Performer notes relevant information about the patient's history and orders for prior preparation:

  i) Notes whether patient has prior history of allergic reaction to contrast or history of allergies. Notes whether allergy test has been ordered and, if so, results.

  ii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.

  iii) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether history of extensive radiography should be reported to radiologist.

  iv) Notes how patient will arrive for examination (whether in wheelchair, on stretcher, accompanied by staff, whether patient will be coherent, already sedated).

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v) Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as respiratory or heart disease, communicable or infectious condition, presence of IV drip, urinary catheter, behavioral disorder, incoherence.

vi) Performer notes whether there are orders on prior preparation of patient such as therapeutic diet, allergy test, lab tests, cessation of oral contraceptive, prior abstinence from morning meal, cleansing enemas, catheterizing of bladder, start of IV drip, prior administration of sedation, tranquilizer, antihistamine, other medication. Notes appropriate timing for medications to take effect.

vii) Checks whether all procedures have been carried out and at appropriate time,and that all reports ordered are with patient's chart. If there is any problem, arranges to have procedures carried out, examination postponed to allow proper timing, reports problem to appropriate staff member, or plans to inform radiologist.

g. Depending on institutional procedures, notes whether performer is to set up equipment and/or prepare patient personally, or whether performer will join angiography team in examination room.

h. If referring physician has requested that prior films, ultrasonograms, scans and test results already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have these delivered.

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i. If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to prepare properly, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

2. Performer prepares ahead so as not to keep patient in examination room longer than necessary. Determines what prior preparations will be needed, such as cleaning and preparation of equipment and accessories, proper dress. May carry out any or all of the following:

a. Goes to appropriate room in the department for the type of examination involved and the equipment required, such as angiography suite, or room assigned on requisition sheet.
b. May decide to clean x-ray equipment or arranges to have this done.
c. Washes hands as appropriate.
d. Reviews the technique chart(s) for the unit(s) to be used (one or two serial changer(s), fluoroscopy unit).

1) Locates information for the area of interest and views likely to be required. Takes note of the exposure factors to be used for overheads and fluoroscopy. Considers preferences of the radiologist involved, conversions needed to account for patient's age, condition, presence of contrast.

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Notes any newly posted changes in technical factors (to reflect accomodation to a change in machine output or a policy decision).

ii) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtract as appropriate.

iii) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

e. Checks for appropriate film supplies:

i) With serial changer(s) using roll film, performer checks that there is an adequate supply for examination loaded in changer(s) and that film is properly loaded.

ii) With serial changers using cassettes, and for scout films, performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Checks that these are loaded with appropriate speed and type of film and grid combinations depending on the patient's size, techniques to be used, type of equipment, and institutional practices.

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iii) If adequate supply is not in room, arranges to obtain or decides to obtain personally.

iv) Makes sure that right (R) and left (L) markers are available for use and identification cards or leaded numerals or markers.

v) Checks that equipment or device is available to number serial films, or checks that cassettes such as vacuum cassettes are prenumbered and are in numerical order.

May prepare identification strip using tape and lead numerals giving appropriate ID information for placement on table or on cassette(s).

May prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write out ID information on card if not received with requisition. Checks identification against requisition sheet.

May place card as appropriate for use with automatic marking device.

f. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator(s) and checks that each indicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for machine to "warm up." Makes sure that all circuits have been stabilized. If appropriate, checks each line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

g. Performer sets up and checks fluoroscopy equipment:

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i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.

ii) Sets x-ray generator mode selector to fluoroscopy mode.

iii) If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

iv) If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

v) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position.

vi) If a grid will be used with the image intensifier for fluoroscopy, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

vii) May adjust distance between focal spot and image intensifier (focal spot to film distance, FFD). May check that TOD is 15 inches or more.

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viii) Performer may collimate fluoroscopy tube depending on nature of the equipment and controls. May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or may set shutter mode selector to automatic collimation.

ix) To check fluoroscopy mode (if not already done), places phantom or appropriate test object on radiography table where patient will be centered for examination.

x) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest. If not already done, moves image intensifier into position; centers (over or under) the area of interest.

xi) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate.

xii) Views test object being fluoroscoped on TV monitor. Adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly. Checks mA meter and notes whether appropriate reading is obtained.

xiii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.

xiv) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

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h. Performer may set up and check serial changer(s) as appropriate to equipment:

   i) As appropriate, sets x-ray mode selector(s) for overhead filming.
   ii) Depending on the type of film changer(s) and examination table to be used, performer may wheel see-through horizontal changer into position under angiography table, may place changer so that patient may be moved to changer on radiolucent top after catheterization, or may place changer so that it may be placed under table after fluoroscopy. May set up second changer in vertical position ready for lateral filming with horizontal beam,or rolls out of way until needed.
   iii) May cycle each unit to check operation. If so, makes sure that anode is not rotating.

i. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

j. Performer notes whether ECG monitoring equipment (if ordered), manometer, and emergency cart are present. Notes who will be assigned to monitor.

k. May check that procedure tray for the examination has been properly prepared or decides to do personally.

   i) Depending on radiologist's orders, checks for appropriate types and sizes of puncture needles, syringes, scalpels, forceps, dressings. Notes whether appropriate antiseptic, saline, anticoagulant, and local anesthetic solutions are present.
   ii) Checks that appropriate aqueous iodine based contrast solution is present. Checks that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool.

l. Checks that proper accessories are available for procedure.

   i) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure, that appropriate shielding is available for placement between radiologist and the patient.
   ii) Checks that appropriate immobilization devices for adult or child and type of procedure are present.
   iii) Checks that extension cones are available.
   iv) Checks for hospital gowns, masks, gloves to be worn for sterile procedure. May check for emesis basin and towels.
   v) May set up footboard, shoulder rests, hand holds on tilt table.

3. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, any prior films, scans, and lab reports to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready:

   a. If performer is to prepare patient in procedure room, may proceed as follows:

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i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves. ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room (wheeled on stretcher or if patient has been sedated; escorted or carried if child or adult patient is to have general anesthesia after entering department). iii) Performer greets a coherent patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet, referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure. iv) Has patient positioned or makes patient comfortable on examination table or on table-top over changer. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to table. If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in locked position. Performer may decide to assist patient to table or has this done. May obtain help. Makes	sure that that no equipment is in the way that may be collided with by patient. If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table. May have nurse carefully place infant in supine position on table, or lifts patient carefully, supporting patient's head, and places on table. v) Makes sure patient is being attended and there is no danger patient will fall off table. If patient has respiration, cardiac or infusion equipment or urinary catheter attached, makes sure that equipment is being monitored and is not dislodged. vi) Checks that patient is in gown, with all jewelry removed; may check that patient is being kept warm. vii) If not already done, questions patient or accompanying adult about prior preparations and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based). viii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy. ix) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

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- x) Answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning or degree of coherence. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.
- xi) Notes the patient's body type, whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points will be easy to find. May estimate location of spleen in the left hypochondrium just below the diaphragm for a frontal scout projection, and behind stomach in contact with the splenic flexure of colon for a lateral scout projection.
- xii) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the abdomen at the level and in the direction(s) in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors. After measuring, has patient rest in as relaxed a position as possible.

b. Performer may inform attending radiologist when patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films and scans to radiologist. Displays radiographs on view boxes.

- i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.
- ii) Performer may accompany radiologist to examination room, greet and/or introduce patient and staff members.

c. If not already done, performer joins radiologist, patient and other staff in examination room.

d. During radiologist's review of requisition, prior radiographic materials, and examination of patient, performer notes radiologist's orders:

- i) If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.
- ii) If radiologist decides to proceed, performer notes radiologist's orders for scout film(s) of the abdomen. Notes any orders on area to include, centering, projections, phase of suspended respiration to employ.
- iii) Performer may provide hospital gown, gloves, mask to radiologist.
- iv) Performer provides leaded apron and gloves to radiologist. Provides patient and anyone who will remain in room during ex-

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posure with appropriate protective shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

4. Performer makes the preliminary scout film(s) as ordered after making sure that patient is being attended. Sets up equipment for the examination before positioning and immobilizing patient:

   a. Performer may place serial changer (s) in position for AP and/or lateral projection(s) or may use cassettes on table and/or in vertical holder depending on institutional procedures:

      i) When using a changer, sets for manual control so that only one scout exposure will be made. Loads changer with appropriate cassette or operates film transport.

      ii) When using cassette, selects appropriate size cassette and places on table for AP projection and/or in vertical holder for lateral projection.

   b. Performer attaches appropriate identification information:

      i) May place right or left marker on cassette as appropriate to the study and projection or depresses appropriate R or L button for automatic marking. May tape R or L marker to patient's body.

      ii) May place identification information on appropriate corner of

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cassette; may set flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette; may place patient's card into card tray for equipment using automatic film marking device.

   c. Performer sets the technical exposure factors for the first (or next) scout projection (or AP and/or lateral projections):

      i) For each projection performer selects the exposure factors as described, taking account of the measurements taken of the patient.

      ii) Sets controls for radiography mode. For each projection selects milliamperage and chooses selectors for the correct focal size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

      iii) Depending on the equipment, may set controls to provide for manual tableside adjustment of collimator, table and x-ray tube height and position (unless these have already been set).

      iv) Performer may set the focal-film distance(s) if not already done. Operates controls or manually moves the x-ray tube(s) into place. Checks each focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

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d. Performer prepares patient for final positioning:

- i) Depending on the patient's age and condition, performer may explain or demonstrate what is required for immobilizing and positioning. May obtain help or help co-worker.
- ii) Performer positions patient on table over changer or cassette in supine position for both AP and lateral projections. May center median sagittal plane or left side of abdomen to midline as ordered.
- iii) Performer may immobilize infant's arms by extending them and placing them along sides of head, next to ears. May apply a sleeve made of a diaper, towel, pillowcase or orthopedic stockinet to hold arms above and behind head, one at each side. May apply a sleeve of stretch gauze or bandage to the pelvis. Wraps lightly to maintain patient in position. May gently turn head to one side and immobilize. Applies head clamp, webbing strap under chin, or sponges so that median sagittal plane of head is at right angles or parallel to cassette. May elevate patient's knees and place restraining band across legs.
- iv) With older patient elevates patient's shoulders and knees so that patient's back is in contact with table. Supports. Adjusts shoulders and hips so that they lie on single transverse planes. May immobilize ankles. Has patient flex elbows and abduct arms.
- v) If patient has a balloon catheter or IV drip in place, is careful not to dislodge apparatus. Makes sure that no radiopaque part is lying over area to be exposed, or that patient is not lying on a clamp.

e. For an AP projection (posterior view) of spleen and abdomen, performer centers film so that the diaphragm is included at the upper border of film. (Estimates location from patient's body type.) Includes the iliac crests at the lower border of film unless otherwise ordered. Centers to the level of the xiphoid process. Palpates for the costal angle just below the xiphoid process or palpates for the heartbeat over the apex of the heart. Directs central ray at right angles to midpoint of film.

f. For a lateral projection of the spleen and abdomen, performer maintains patient in supine AP position. Places vertical cassette holder or changer on patient's left side, centered to the mid-axillary line of body at the level of the area of interest. Directs central ray horizontally at right angles to midpoint of film.

g. If not yet completed, performer immobilizes patient in position.

- i) Places restraining bands, strips of gauze, and adhesive tape as needed, May use head clamp. Avoids use of compression band across abdomen or chest.
- ii) May check that there is no rotation of pelvis by measuring the distance from the anterior superior iliac spine to table top on each side. Overcomes rotation of pelvis due to swelling or atrophy by elevating appropriate side.

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iii) After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

iv) Checks final positioning using light in collimator. Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows as reference for center of field, and uses the collimator light to center the tube to the part and/or film.

v) Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube to provide better centering.

h. Once the patient has been positioned and immobilized, performer adjusts the collimator so as to expose only the area of interest as defined by radiologist.

i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.

ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

i. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination. Makes sure that anyone remaining in room is supplied with lead gloves and apron and stays out of central beam, especially horizontal beam.

j. Performer may rehearse coherent patient in breathing out and holding or breathing in and holding, depending on orders, or observes patient's breathing and plans exposure for the appropriate quiet phase such as after expiration.

k. Performer makes the exposure:

i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells patient when to hold breath as rehearsed or observes patient's breathing and times exposure to the appropriate quiet phase required.

iii) Performer initiates exposure by pressing hand trigger or exposure control button.

iv) While exposure is underway, performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.

v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.

vi) After exposure is completed, tells patient that he or she can relax. Returns to patient. Removes the cassette or exposed

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film as appropriate for processing. Removes any markers from cassette for further use.

l. If scout films in both AP and lateral projections are ordered, performer maintains patient in same position; proceeds with right angle projection as described, using appropriate technical factors.

m. Performer arranges to have the scout film(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

   i) While film(s) are being processed, makes sure that patient is comfortable and attended by staff person or self.
   ii) Performer brings the processed scout film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist when the radiograph(s) are ready. May place prior films for viewing as well.

5. During radiologist's review of the scout film(s) performer notes radiologist's orders on how to proceed:

   a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.
   b. If radiologist decides that additional preparatory steps are needed, such as cleansing of gastrointestinal tract, sedation, medication, transfusion, may arrange to have these carried out and/or performer arranges to reschedule patient.

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   c. Performer notes whether radiologist requires a change in technical factors and/or patient positioning, centering, or central ray angulation for later serial filming.

      i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.
      ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

   d. If radiologist will proceed, notes orders on sequence of examination:

      i) Notes final choice of puncture site. May supply lead marker for radiologist to mark abdomen at a point indicating the position of the spleen at the respiration phase chosen for puncture and filming.
      ii) Notes whether general anesthesia will be used.
      iii) Notes whether splenic pressure will be taken.
      iv) Notes final orders on sizes and types of puncture needle, amount of contrast, shielding.
      v) Notes the radiologist's orders for seriography program. Notes the number of exposures and sequences, rate per second, and intervals between sequences. Notes number of injections anticipated.
      vi) If computer control will be used (giving the number of

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films to be taken, per second intervals, number of separate series) performer arranges to have keypunch control card prepared or delivered and checked, or decides to do personally. When ready, performer places as appropriate in control panel of computer.

vii) Discusses sequence and timing of procedure and assignment of duties if not already done. May arrange signals for operation of fluoroscopic exposure controls and/or serial exposures.

6. Performer carries out preparations for angiography as ordered by radiologist based on the part of the work for which performer will be responsible. May carry out any or all of the following:

   a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray. May assist in preparation of puncture needle, syringes containing saline solution, local anesthetic, anticoagulant, contrast solution.
   b. If performer will be responsible for filming, prepares ahead for fluoroscopic monitoring and serial filming:

      i) May reset technical factors for fluoroscopy and serial filming based on radiologist's review of scout film(s) and the presence of contrast.
      ii) Depending on equipment, performer may wheel serial changer out of the way until fluoroscopy is completed; may make sure that everything is ready to lift patient from examination table on radiolucent table top to horizontal serial changer after fluoroscopy.
      iii) If not already done, sets program for serial changer as appropriate. Checks that planned exposure time does not exceed available capacity of unit. If not already done and computer program will be used, checks keypunch control card and places in computer control panel.
      iv) Performer may load cassette changer with proper number of vacuum or other type of cassettes as ordered. (If appropriate, loads cut film changer or roll film changer.) If the same changer will be used for lateral and AP projections, loads only enough cassettes for series in the first projection to avoid artifact caused by shadow from last exposure in one position on the first cassette to be used in next projection.
      v) For computer controlled unit, plugs synchronization cable from control unit into appropriate receptacle on the x-ray control panel.
      vi) Performer may set up equipment for automatic marking of films in numerical sequence or records cassette numbers for the sequence.

   c. If performer is to assist with preparation of patient for puncture, washes hands observing sterile technique when appropriate.

      i) Positions patient in supine position. Abducts left arm or immobilizes above head. Provides access to the intercostal space

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at the mid axillary line where spleen is close to abdominal wall as marked by radiologist.

ii) Immobilizes patient as appropriate. May adjust shoulder supports, apply wrist restraints.

iii) May swab puncture site area with antiseptic solution and cover surrounding area with sterile towels.

iv) If appropriate, may make sure that ECG monitoring leads have been applied, or decides to do personally. Makes sure that someone is assigned to take splenic pressure reading when appropriate.

d. Makes sure that everyone to remain in room is properly shielded. Places lead screen in place to protect radiologist during hand injection of contrast.

e. May receive or obtain a clean hospital gown, cotton "boots," cap and mask. Dons these before approaching sterile area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids touching patient, drapes, radiologist, nurse, or instrument table with non-sterile object.

f. Informs radiologist when patient and materials are ready.

g. If patient is to have general anesthesia, performer awaits signal that procedure can begin.

h. During injection of local anesthetic, puncture, and placement of needle, performer assists as appropriate:

i) May hand materials and supplies asked for using sterile technique.

ii) May assist with fluoroscopic viewing of needle placement.

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On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders. May operate tilt table on orders from radiologist.

iii) Performer may assist with attachment of syringes to flush needle or teflon sheath, and/or to inject contrast solution for fluoroscopic check of needle placement.

iv) Repeats as appropriate for any alternative site.

v) May assist with attachment of manometer and recording of splenic pressure as directed.

7. At appropriate time as indicated, performer assists and coordinates filming with radiologist's manual injection of contrast:

a. May assist in positioning patient on table or over changer:

i) May assist in moving patient on table top to horizontal changer.

ii) May roll horizontal changer into position under angiography table.

iii) Performer may position patient in supine position as described and set up for AP projection.

b. Performer checks that serial changer is loaded, locked and ready.

i) Centers and adjusts x-ray tube.

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ii) Centers changer to area of interest indicated by radiologist or lead marker.

iii) Collimates to the smallest possible exposure area and checks patient's and radiologist's shielding.

c. On signal from the radiologist, performer starts the automatic film changer or initiates the computer control of the serial exposures at the control panel.

d. If performer will continue with lateral projections, performer centers changer in vertical position as described (if not already done).

i) Resets technical factors if required; repeats collimation and shielding.

ii) If one changer is being used, reloads changer with cassettes or adjusts roll or cut film transport for additional serial projections. Sets up as described earlier.

iii) Coordinates injection and filming as described.

e. Performer has the serial films processed at once or decides to do personally.

i) Makes sure that serial films are numbered for appropriate order in sequence.

ii) When the serial films have been processed, performer may place on view boxes in appropriate serial order. Notifies radiologist when they are ready.

f. Throughout procedure performer remains alert for any symptom of emergency or adverse reaction to contrast. As soon as performer judges that there is a reaction, performer notifies radiologist.

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May assist as appropriate with emergency care.

8. While radiologist reviews the first series of splenoportograms, performer notes decisions on continuation of examination:

a. Performer notes whether radiologist will repeat any steps with a change in injection site, with injection of additional contrast, with a change in serial program or technical factors, and/or with different projections.

b. If radiologist decides to repeat any exposures, performer resets technical exposure factors and/or serial program if required and repeats appropriate steps. If radiologist orders additional views, performer makes any changes in x-ray tube position, angulation, position of changer and/or serial program as appropriate.

i) Performer centers, collimates, sets technical factors and provides shielding as appropriate or ordered.

ii) Repeats filming in coordination with injection as described. Repeats processing of films and placement for review.

iii) Shows subsequent serial splenoportograms to radiologist as processed, and proceeds as described above until radiologist indicates that examination is completed.

c. On orders from radiologist, performer makes a plain film of the abdomen (as described for scout filming) and places for radiologist's review to judge whether any contrast medium has been de-

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posited outside the spleen. Assists as appropriate with any measures to remove contrast.

9. When informed by the radiologist that the radiographic examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

   a. May assist while radiologist removes connecting tubes, syringes and needle or teflon sheath. Removes any markers from patient's body.
   b. May prepare to apply pressure dressing to puncture site after manual pressure has been applied.
   c. Performer coordinates with anesthesiologist if present and/or other staff members responsible for recovery and after-care of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room. Makes sure that patient will be kept lying on the left side for appropriate number of hours if so ordered.
   d. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders additional examination and/or delayed films, tests.
   e. Performer records the examination according to institutional procedures. May include date, room, examination type, the serial views taken, the technical factors used, and film sizes. May record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.

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   f. Performer may record the fluoroscopic exposure including exposure time and rad dosage from posted data.
   g. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements.
   h. Performer may return accessories such as computer control cards and immobilization devices to appropriate locations or has this done.
   i. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or has this done, depending on institutional procedures.
   j. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected, set for fluoroscopy;scout films taken;radiologist assisted with puncture,catheterization;pt. and equipment positioned,set up for serial filming;filming coordinated with injection;films sent for processing,radiologist's review;procedures repeated,continued as ordered;examination recorded;arteriograms placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen; computer control panel,cable,keypunch cards;gowns, gloves,masks;technique,standard view,tube rating, rad exposure charts;phantom;x-ray generator(s),tube (s),control panel(s),extension cones;fluoroscopy unit,TV monitor,grid,image intensifier;cassettes; shielding;collimator(s);serial changer(s);tilt-table, radiolucent table top;tourniquet;marking pen;weights; R-L,ID device or markers;immobilization devices; tape;ECG equipment;emergency cart;sterile procedure tray for puncture,catheterization;antiseptic,saline, anticoagulant,local anesthetic,iodine based contrast, disinfectant solutions;swabs,drape,syringes;stretcher;wheelchair;calipers

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Non-pediatric pt.;radiologist;nurse;co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking selective subclavian arteriograms of non-pediatric pt. for thoracic outlet syndrome evaluation by reviewing request;measuring,reassuring pt.;setting up for fluoroscopy,serial filming;making scout films;assisting with sterile puncture,catheterization;identifying films;applying shielding;collimating;setting technical factors;positioning pt. for maneuvers;immobilizing;making serial films in coordination with injection;having films processed,reviewed;repeating,adjusting as ordered;placing arteriograms for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a non-pediatric patient scheduled for selective subclavian arteriography to evaluate thoracic outlet syndrome (contrast study of neurovascular syndromes with compression of the subclavian artery and brachial plexus at the superior aperture of the thorax by means of selective catheterization) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s).

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for, the purpose and the areas involved:

      1) Performer notes side and area of interest, whether a bilateral study may be done.

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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Notes suggested puncture site, whether supine and/or seated erect filming is planned.

- ii) Performer reads patient's name, identification number, sex, age, weight, and height.
- iii) Notes name of radiologist in charge, names of other staff members to assist, examination room, time scheduled.

b. Performer notes orders on equipment and materials:

- i) Notes type of serial film changer ordered, whether cassette, roll film, cut film, whether for supine and/or for upright filming, whether computer controlled, whether equipped with "see-through" top. Notes type of table, whether angiography table, normal tilt-table. Notes whether patient will be moved from angiography table to changer, whether changer will be rolled under or beside table, or whether see-through changer will be kept in place under table throughout procedure.
- ii) Notes type and amount of iodine based contrast solution ordered. Notes orders for type and amount of antiseptic, anticoagulant, local anesthetic, saline solutions.
- iii) Notes types and sizes of puncture needle, catheters, guide wires.
- iv) Notes planned maneuvers and whether weights will be used. If so, notes the poundage of the weights ordered.
- v) Notes whether ECG monitoring equipment has been ordered.

c. Performer considers the accessory equipment, technical factors,

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shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment to be used and the patient positions to be used.

- i) May check that the type of equipment ordered is available in examination room assigned.
- ii) Notes appropriate sterile procedures required, appropriate shielding for the examination.
- iii) Notes whether film processing equipment is available adjacent to procedure room.
- iv) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.

d. Performer notes relevant information about the patient's history and orders for prior preparations:

- i) Notes whether patient has prior history of allergic reaction to contrast or history of allergies. Notes whether allergy test has been ordered and, if so, results.
- ii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.
- iii) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent

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past, whether history of extensive radiography should be reported to radiologist.

iv) Notes how patient will arrive for examination (whether in wheelchair, on stretcher, accompanied by staff, whether patient will be coherent, already sedated).

v) Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as respiratory or heart disease, communicable or infectious condition, presence of IV drip, urinary catheter,behavioral disorder, incoherence.

vi) Performer notes whether there are orders on prior preparation of patient such as therapeutic diet, allergy test, lab tests, cessation of oral contraceptive, prior abstinence from morning meal, start of IV drip, shaving of puncture site, prior administration of sedation, tranquilizer, antihistamine, other medication. Notes appropriate timing for medications to take effect.

vii) Checks whether all procedures have been carried out and at appropriate time and that all reports ordered are with patient's chart. If there is any problem, arranges to have procedures carried out, examination postponed to allow proper timing, reports problem to appropriate staff member,or plans to inform radiologist.

e. Depending on institutional procedures, notes whether performer is to set up equipment and/or prepare

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patient personally, or whether performer will join angiography team in examination room.

f. If referring physician has requested that prior films, scans and test results already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have these delivered.

g. If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to prepare properly, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

2. Performer prepares ahead so as not to keep patient in examination room longer than necessary. Determines what prior preparations will be needed, such as cleaning and preparation of equipment and accessories, proper dress. May carry out any or all of the following:

a. Goes to appropriate room in the department for the type of examination involved and the equipment required, such as angiography suite, or room assigned on requisition sheet.

b. May decide to clean x-ray equipment or arranges to have this done.

c. Washes hands as appropriate.

d. Reviews the technique chart(s) for the unit(s) to be used (one

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or two serial changer(s), fluoroscopy unit).

i) Locates information for the area of interest and views likely to be required. Takes note of the exposure factors to be used for overheads and fluoroscopy. Considers preferences of the radiologist involved, conversions needed to account for patient's age, condition, use of contrast. Notes any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).

ii) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.

iii) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

e. Checks for appropriate film supplies:

i) With serial changer(s) using roll film, performer checks that there is an adequate supply for examination loaded in changer(s) and that film is properly loaded.

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ii) With serial changers using cassettes and for scout films, performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Checks that these are loaded with appropriate speed and type of film and grid combinations depending on the patient's size, technique to be used, type of equipment and institutional practices.

iii) If adequate supply is not in room, arranges to obtain or decides to obtain personally.

iv) Checks that equipment or device is available to number serial films, or checks that cassettes such as vacuum cassettes are prenumbered and are in numerical order.
May prepare identification strip using [illegible] and lead numerals giving appropriate ID information for placement on table or cassette(s).
May prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write out ID information on card if not received with requisition.
Checks identification against requisition sheet.
May place card as appropriate for use with automatic marking device.

v) Makes sure that right (R) and left (L) markers are available for use.

f. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator(s) and checks that each in-

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dicator light shows that machine is "warmed up," or turns on main switch as appropriate to equipment and allows time for machine to "warm up." Makes sure that all circuits have been stabilized. If appropriate, checks each line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

g. Performer sets up and checks fluoroscopy equipment:

  i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.
  ii) Sets x-ray generator mode selector to fluoroscopy mode.
  iii) If not already done, performer connects TV power outlet. Turns on monitor and checks that "ready" light is on.
  iv) If appropriate, performer selects the proper field size selector (if there is dual image intensifier).
  v) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position.
  vi) If a grid will be used with the image intensifier for fluoroscopy, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.
  vii) May adjust distance between focal spot and image intensifier (focal spot to film distance, FFD). May check that TOD is 15 inches or more.
  viii) Performer may collimate fluoroscopy tube depending on nature of the equipment and controls.
  May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or may set shutter mode selector to automatic collimation.
  ix) To check fluoroscopy mode (if not already done) places phantom or appropriate test object on radiography table where patient will be centered for examination.
  x) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest.
  If not already done, moves image intensifier into position; centers (over or under) the area of interest.
  xi) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate.
  xii) Views test object being fluoroscoped on TV monitor. Adjusts kVp control (and mA control if appropriate) and observes effects on TV moni-

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tor to be sure that equipment is operating properly. Checks mA meter and notes whether appropriate reading is obtained.

xiii) Performer checks that TV brightness controls are operating and adjusts for preliminary viewing.

xiv) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

h. Performer may set up and check serial changer(s) as appropriate to equipment:

i) As appropriate, sets x-ray mode selector(s) for overhead filming.

ii) Depending on the type of film changer(s), examination table and patient positions to be used,performer prepares for supine or erect AP filming. Performer may wheel see-through horizontal changer into position under angiography table; may position changer so that patient may be moved on radiolucent table top to changer after catheterization, or may place changer so that it can be wheeled under table. Performer may position upright changer so that patient can be seated in front of it after catheterization. May wheel it out of the way until needed. Performer may prepare two changers to allow for upright as well recumbent serial filming.

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iii) May cycle each unit to check operation. If so, makes sure that anode is not rotating.

i. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

j. Performer notes whether ECG monitoring equipment (if ordered) and emergency cart are present. Notes who will be assigned to monitor.

k. May check that procedure tray for the examination has been properly prepared or decides to do personally. Checks for proper accessories.

i) Depending on radiologist's orders, checks for appropriate types and sizes of puncture needles, tourniquet, catheters, syringes,scalpels, guide wires, forceps, dressings. Notes whether appropriate antiseptic, saline, anticoagulant, and local anesthetic solutions are present.

ii) Checks that appropriate aqueous iodine based contrast solution is present. Checks that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool.

iii) Checks that appropriate immobilization devices and weights are available.

iv) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure, that appropriate shielding is available for

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placement between radiologist and the patient.

- v) Checks that extension cones are available.
- vi) Checks for hospital gowns, masks, gloves to be worn for sterile procedure. May check for sterile drape, emesis basin, and towels.

3. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, any prior films, scans, and lab reports to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready:

   a. If performer is to prepare patient in procedure room, may proceed as follows:

      - i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.
      - ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room (wheeled on stretcher if patient has already been sedated).
      - iii) Performer greets a coherent patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet, referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

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      - iv) Has patient positioned or makes patient comfortable, seated on chair or table,or lying on examination table or over changer.
        If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to table.
        If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.
        Performer may decide to assist patient to table or chair or has this done. May obtain help.
        Makes sure that no equipment is in the way that may be collided with by patient.
        If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.
      - v) Makes sure patient is being attended and there is no danger patient will fall off table. If patient has respiration, cardiac or infusion equipment attached, makes sure that equipment is being monitored and is not dislodged.
      - vi) Checks that patient is in gown, with all jewelry removed.
      - vii) If not already done, questions patient or accompanying staff member about any prior preparations and about any allergies,

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especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

viii) If appropriate and not already done, performer questions female patient of child-bearing age regarding possible pregnancy.

ix) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded,performer informs radiologist in charge at once; proceeds only with approval.

x) Answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning or degree of coherence. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

xi) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the body at the level and in the direction in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors. After measuring, has patient rest in as relaxed a position as possible.

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b. Performer may inform attending radiologist when patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films and scans to radiologist. Displays radiographs on view boxes.

i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

ii) Performer may accompany radiologist to examination room, greet and/or introduce patient and staff members.

c. If not already done, performer joins radiologist, patient and other staff in examination room.

d. During radiologist's review of requisition, prior radiographic material(s), and examination of patient, performer notes radiologist's orders:

i) If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.

ii) If radiologist decides to proceed, performer notes radiologist's orders for scout

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film. Notes patient position, centering, area of interest and projection required and the phase of suspended respiration to employ.

iii) Performer may provide hospital gown, gloves, mask to radiologist.

iv) Performer provides leaded apron and gloves to radiologist. Provides patient and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

4. Performer makes the preliminary scout film as ordered after making sure that patient is being attended. Sets up equipment for the examination before positioning and immobilizing patient:

   a. Performer determines whether a bilateral view is required or notes side of interest. Determines whether patient is to lie in supine AP position or will be seated in erect position facing away from film.

   b. Performer may use serial changer set for manual control so that only one scout exposure will be made, or cassette on table or in vertical holder.

      i) Loads changer with appropriate cassette, or operates film transport, or selects appropriate size cassette for scout film.

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      ii) Places horizontal changer, or cassette on table, in preparation for supine AP projection, or positions vertical changer or cassette holder in position for patient to be seated in front of it for erect view.

   c. Performer attaches appropriate identification information:

      i) May place right or left marker on cassette as appropriate to the study and projection or depresses appropriate R or L button for automatic marking. May tape R or L marker to patient's body.

      ii) May place identification information on appropriate corner of cassette; may set flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette; may place patient's card into card tray for equipment using automatic film marking device.

   d. Performer sets the technical exposure factors for the scout projection:

      i) Performer selects the exposure factors as described, taking account of the measurements taken of the patient.

      ii) Sets controls for radiography mode. Selects milliamperage and chooses selectors for the correct focal size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

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iii) Depending on the equipment, may set controls to provide for manual tableside adjustment of collimator, table and x-ray tube height and position (unless these have already been set).

iv) Performer may set the focal-film distance(s) if not already done. Operates controls or manually moves the x-ray tube(s) into place. Checks focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

e. Performer prepares patient for final positioning:

i) Performer prepares patient on table over changer, or seated erect facing away from vertically placed film.

ii) Performer may enlist patient's cooperation and/or obtain help in positioning patient.

f. For a neutral AP projection (posterior view) of the shoulder and chest, performer centers the median sagittal plane of patient's body to midline for bilateral projection, or centers chest and shoulder on side of interest so that the center of area of interest is at the midline.

i) Has patient place arms in a comfortable, relaxed position at sides. Adjusts shoulders to lie on a single transverse plane. May have supine patient flex hips and knees to put the back in contact with table. Immobilizes feet.

ii) Centers film so that upper margin is about two inches

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above the supraclavicular area (upper border of shoulders).

iii) Directs central ray at right angles to midpoint of film or as ordered, vertically for supine patient and horizontally for erect patient.

g. If not yet completed, performer immobilizes patient in position as appropriate. May apply restraining bands.

i) After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

ii) Checks final positioning using light in collimator. Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows as reference for center of field, and uses the collimator light to center the tube to the part.

iii) Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube to provide better centering.

h. Once the patient has been positioned and immobilized, performer adjusts the collimator so as to expose only the area of interest as defined by radiologist.

i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to

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minimum size needed to cover the area of interest.

ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

i. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination. Makes sure that anyone remaining in room is supplied with lead gloves and apron and stays out of central beam, especially horizontal beam.

j. Performer may rehearse coherent patient in breathing out and holding or breathing in and holding, depending on orders, or observes patient's breathing and plans exposure for the appropriate quiet phase.

k. Performer makes the exposure:

i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.

ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells patient when to hold breath, or observes patient's breathing and times exposure to the appropriate quiet phase required.

iii) Performer initiates exposure by pressing hand trigger or exposure control button.

iv) While exposure is underway, may check that mA meter records appropriate current as set, that kVp meter dips slightly.

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v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.

vi) After exposure is completed, tells patient that he or she can relax. Returns to patient. Removes the cassette or exposed film as appropriate for processing. Removes any markers from cassette for further use.

l. Performer arranges to have the scout film processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

i) While film is being processed, makes sure that patient is comfortable and attended by staff person or self.

ii) Performer brings the processed scout film directly to the radiologist in charge, places on view box, and/or arranges to have viewed in darkroom; informs radiologist when the radiograph is ready. May place prior films for viewing as well.

5. During radiologist's review of the scout film, performer notes radiologist's orders on how to proceed:

a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.

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b. Performer notes whether radiologist requires a change in technical factors and/or patient positioning, centering, or central ray angulation for later serial filming.

  i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.
  ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

c. If radiologist will proceed, notes radiologist's final orders on sequence of examination and use of contrast and equipment:

  i) Notes final choice of puncture site.
  ii) Notes the series of maneuvers to be carried out, sequence and positions for filming.
  iii) Notes additional preparation of patient required such as sedation, IV drip, shaving and preparation of puncture site.
  iv) Notes final orders on types and sizes of puncture needle, catheter, guide wire, type and amount of contrast solution.
  v) Notes the radiologist's orders for seriography program. Notes the number of exposures and sequences, rate per second, and intervals between sequences. Notes number of injections anticipated.
  vi) If computer control will be used (giving the number of films to be taken, per second intervals, number of separate series), performer arranges to have keypunch control card prepared or delivered and checked, or decides to do personally. When ready, performer places as appropriate in control panel of computer.
  vii) Discusses sequence and timing of procedure and assignment of duties if not already done. May arrange signals for operation of fluoroscopic exposure controls.
  viii) Performer may participate and assist as radiologist explains, demonstrates, and rehearses patient in each maneuver in sequence, such as neutral position (as for scout), Adson maneuver, modified Allen, modified Adson, weight lifting, and maximum symptom position. Notes appropriate centering of film and central ray for each. May arrange signals with radiologist on when to make each exposure.

6. Performer carries out preparations for angiography as ordered by radiologist, based on the part of the work for which performer will be responsible. May carry out any or all of the following:

  a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray. May assist in preparation of catheters, puncture needle, syringes containing saline solution, local anesthetic, anticoagulant, contrast solution. Notes or checks amounts ordered. Checks contrast

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for signs of chemical deterioration.

b. If performer will be responsible for filming, prepares ahead for fluoroscopy and serial filming:

  i) May reset technical factors for fluoroscopy and serial filming based on radiologist's review of scout film and the presence of contrast.
  ii) If not already done, sets program for serial changer as appropriate. Checks that planned exposure time does not exceed available capacity of unit.
  If not already done and computer program will be used, checks keypunch control card and places in computer control panel.
  iii) Performer may load cassette changer with proper number of vacuum or other type of cassettes as ordered. (If appropriate, loads cut film changer or roll film changer.)
  iv) For computer controlled unit, plugs synchronization cable from control unit into appropriate receptacle on the x-ray control panel.
  v) Performer may set up equipment for automatic marking of films in numerical sequence, or records cassette numbers for the sequence.
  vi) Depending on equipment, performer may wheel serial changer out of the way until fluoroscopy is completed; may make sure that everything is ready to lift patient from examination table on radiolucent table top to horizontal serial changer after fluoroscopy; or prepares to seat patient afterwards in front of vertical changer.

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c. If performer is to assist with preparation of patient for catheterization, washes hands observing sterile technique when appropriate.

  i) If not already done, may arrange to have puncture site shaved and prepared (right and/or left femoral or axillary artery). Has patient lie in supine position.
  ii) Positions patient for access to puncture site.
  For femoral artery puncture, abducts patient's legs and exposes the femoral artery on the side to be punctured below the inguinal ligament, as high as possible, but allowing for later compression proximal to puncture site.
  For axillary artery puncture has patient abduct area on side to be punctured with elbow bent. Provides access to area of the axilla.
  iii) Immobilizes patient as appropriate. May use wrist restraints.
  iv) May swab puncture site area with antiseptic solution and cover surrounding area with sterile towels.
  v) If appropriate, may make sure that ECG monitoring leads have been applied, or decides to do personally.

d. Makes sure that everyone to remain in room is properly shielded; places lead screen in position to protect radiologist during hand injection of contrast.

e. May receive or obtain a clean hospital gown, cotton "boots," cap and mask. Dons these before

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approaching sterile area. Avoids touching patient, drapes, radiologist, nurse,or instrument table with non-sterile object. f. Informs radiologist when patient and materials are ready. g. During injection of local anesthetic, puncture,placement of needle and advancing of catheter, performer assists as appropriate: i) May hand materials and supplies asked for using sterile technique. ii) May assist with fluoroscopic viewing of needle and progress of catheter placement. On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders. Continues as ordered. iii) Performer may operate tilt table on orders from radiologist, or assist in positioning patient as ordered. Continues as ordered. iv) May assist with attachment of syringes to flush catheter, inject contrast solution for fluoroscopic check of catheter placement. v) Repeats as appropriate for alternative site. vi) Once catheter position is judged satisfactory,may tape into position,maintaining sterile field. vii) With axillary route,performer may assist with application of tourniquet around arm, distal to the puncture site. 7. When the radiologist has advanced the catheter to the appropriate loca-	tion in the subclavian artery on the first side of interest, performer coordinates with radiologist as ordered: a. If appropriate, wheels horizontal changer under table, assists in moving patient in supine position from table to changer, or assists in seating patient in front of vertical changer. b. Performer checks that serial changer is loaded, locked and ready, that technical factors are correct and controls set for radiography mode. c. Performer positions film or patient as appropriate for AP projection of shoulder and chest on side of interest: i) For neutral position, centers as for scout film on side of interest. ii) For Adson maneuver, uses upright changer with patient in erect seated AP position. Has patient place arm in lap or on knee. Has patient extend neck and turn chin toward the side of interest. Awaits radiologist's orders to patient on breath control. iii) For modified Allen maneuver,positions patient in seated or supine position as ordered. Has patient abduct upper arm on side of interest as close to 90° as possible and rotate lower arm outward. Has patient turn head away from side of interest. Awaits radiologist's orders to patient on breath control. iv) For modified Adson maneuver, maintains patient in position as for modified Allen maneuver,

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but has patient turn head towards the side of interest.

- v) For weight lifting maneuver, uses horizontal changer with patient in supine AP position. Has patient abduct humerus on the side of interest about 60° and rotate it slightly outward. Has patient flex elbow with palm up, resting on table or changer top. Places weight selected by radiologist on palm with palm supported by table top. Awaits radiologist's orders to patient to attempt to lift weight (during injection).
- vi) For maximum symptom position, has patient repeat position in which most symptoms appeared as rehearsed with radiologist, and hold until told to relax.

d. Performer centers and directs central ray as appropriate to area of interest, and collimates to the smallest possible exposure area. Checks patient's and radiologist's shielding.

e. On signal from the radiologist, performer starts the serial film changer or initiates the computer control of the serial exposures at the control panel.

f. If performer will continue with additional maneuvers before processing films, repeats for appropriate maneuvers as described and as ordered.

g. Performer has the serial films processed at once or decides to do personally.

- i) Makes sure that serial films are numbered for appropriate order in sequence.
- ii) When the serial films have been processed, performer may place on view boxes in appropriate serial order. Notifies radiologist when they are ready.

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8. While radiologist reviews the first series of subclavian arteriograms, performer notes decisions and continues with examination as ordered:

a. Notes whether any position or injection will be repeated with a change in technical factors, in serial program, or change in position, such as erect positioning after supine, or the reverse.

b. Notes whether additional maneuvers will be used.

c. Notes whether radiologist will catheterize the opposite subclavian artery and repeat any or all of the examination for the other side.

d. If appropriate, performer assists with catheterization, fluoroscopic monitoring and making exposures for the other side, repeating appropriate steps.

e. If appropriate for a change of patient position, performer moves serial changer into opposite position such as from horizontal to vertical filming or sets up second changer as appropriate, as described.

f. As appropriate, performer resets technical factors, serial program as ordered, and repeats appropriate steps.

- i) Centers, collimates, and provides shielding as appropriate or ordered.
- ii) Repeats filming in coordination with injection as described. Repeats processing of films and placement for review.

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iii) Shows subsequent serial arteriograms to radiologist as processed, and proceeds as described above until radiologist indicates that examination is completed.

g. Throughout procedure performer remains alert for any symptom of emergency or adverse reaction to contrast. As soon as performer judges that there is a reaction, performer notifies radiologist. May assist as appropriate with emergency care. Performer may place tilt table in Trendelenburg position when ordered, may assist with injection of anticoagulant or with application of hot packs as ordered.

9. When informed by the radiologist that the radiographic examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

a. May assist while radiologist removes connecting tubes, syringes, and catheter. Removes any markers from patient's body.
b. May prepare to apply pressure to arterial puncture site when ordered. May prepare to apply pressure dressing to puncture site after manual pressure has been applied.
c. Performer coordinates with the staff members responsible for recovery and after-care of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room.
d. May present requisition form to radiologist for comments and

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signature. May supply form if radiologist orders additional examination and/or delayed films or tests.
e. Performer records the examination according to institutional procedures. May include date, room, examination type, the serial views taken, the technical factors used, and film sizes. May record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.
f. Performer may record the fluoroscopic exposure including exposure time and rad dosage from posted data.
g. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements. Makes sure that any nondisposable guide wires and catheters are cleaned and flushed immediately after use and before sterilization.
h. Performer may return accessories such as computer control cards and immobilization devices to appropriate locations or has this done.
i. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or has this done, depending on institutional procedures.
j. May indicate to appropriate staff person when the performer is ready to proceed with next examination.

TASK DESCRIPTION SHEET

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This is page 1 of 22 for this task.

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured,measured;films identified;technical factors selected,set for fluoroscopy;scout films taken;radiologist assisted with puncture,catheterization;pt. and equipment positioned,set up for automatic injection,serial filming,magnification,spotfilming;filming coordinated with injection;films sent for processing,radiologist's review;procedures repeated,continued as ordered;examination recorded;angiograms placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen;computer control panel,cable,keypunch cards;gowns, gloves,masks;technique,standard view,tube rating,rad exposure charts;phantom;x-ray generator(s),tube(s), control panel(s),extension cones;fluoroscopy unit,TV monitor,grid,image intensifier;cassettes;shielding; collimator(s);serial changer(s);tilt-table,radiolucent table top;spotfilm device,roll film;R-L,ID device or markers;cardiac monitoring equipment,manometer;automatic injector;immobilization devices;tape; emergency cart;sterile procedure tray for puncture, catheterization;antiseptic,saline,anticoagulant, local anesthetic,iodine based contrast,disinfectant solutions;swabs,drape,syringes;stretcher;wheelchair; calipers

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.;radiologist;anesthesiologist;nurse;co-worker; cardiologist;cardiac team;surgeon

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking selective pulmonary angiograms or selective angiocardiograms of any pt. by reviewing request;measuring,reassuring pt.;setting up for fluoroscopy, serial filming (single or biplane),magnification, spotfilming,automatic pressure injection;making scout films;assisting with sterile puncture,catheterization,fluoroscopy;identifying films;applying shielding;collimating;setting technical factors;positioning,immobilizing pt.;making serial films in coordination with injection;having films processed,reviewed; repeating,continuing,adjusting as ordered;placing angiograms for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a patient scheduled for selective pulmonary angiography or selective angiocardiography (contrast study of the pulmonary arteries and veins by means of selective catheterization of right atrium, right ventricle, main pulmonary artery, and/or right and/or left branch pulmonary arteries) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s).

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for, the purpose and the areas involved:

      1) Notes whether the area of interest is limited to the pulmonary artery and/or right or left

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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pulmonary branch(es) or includes the heart and/or pulmonary valve.

- ii) Notes planned puncture site, planned route for catheterization, and planned site(s) for injections.
- iii) Notes whether surgical "cut down" technique or closed percutaneous approach will be used, whether local or general anesthesia is recommended.

b. Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is emergency patient.

c. Notes name of radiologist in charge, names of other staff members to assist, such as anesthesiologist, surgeon, cardiologist, cardiac monitoring team, co-worker. Notes examination room, time scheduled, and whether or when performer is to report for preliminary preparations.

d. Performer notes orders on equipment and materials:

- i) Notes type of serial film changer ordered, whether cassette, roll film, cut film, whether single or biplane, whether computer controlled, whether equipped with "see-through" top. Notes type of table, whether angiography table, normal tilt-table or rotating table. Notes whether patient will be moved from angiography table to changer, whether changer will be rolled under or beside table, or whether, with see-through changer, horizontal changer will be kept in place under table throughout procedure.
- ii) Notes whether spotfilming and/or whether magnification with serial or spotfilm technique may be ordered.

List Elements Fully

- iii) Notes type of iodine based contrast solution ordered, type of automatic injection equipment. Notes orders for type and amount of antiseptic, anticoagulant, local anesthetic, saline solutions.
- iv) Notes orders on types and sizes of puncture needle, guide wires, catheter sizes and types, whether preformed, type of end (straight, j-shaped, pigtail, closed or open ended, whether with side holes).
- v) Checks type of cardiac and pressure monitoring equipment ordered, whether transfusion equipment may be needed.

e. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, equipment, the examination ordered, and the areas of interest.

- i) May check that the type of equipment ordered is available in examination room assigned. If general anesthesia may be given, may check that x-ray equipment is compatible for use with anesthesia equipment.
- ii) Notes appropriate sterile procedures required, appropriate shielding for the examination.
- iii) Notes whether film processing equipment is available adjacent to procedure room.
- iv) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.

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f. Performer notes relevant information about the patient's history and orders for prior preparation:

i) Notes whether patient has prior history of allergic reaction to contrast or history of allergies. Notes whether allergy test has been ordered and, if so, results.

ii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.

iii) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether history of extensive radiography should be reported to radiologist.

iv) Notes how patient will arrive for examination (whether in wheelchair, on stretcher, accompanied by staff, whether patient will be coherent, already sedated).

v) Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as respiratory or heart disease, communicable or infectious condition, presence of IV drip, urinary catheter, behavioral disorder, incoherence.

vi) Performer notes whether there are orders on prior preparation of patient such as therapeutic diet, cessation of oral contraceptive, allergy, lab tests, record of circulation time test, prior abstinence from morning meal, cleansing enemas, catheterizing of bladder, start of IV drip, prior administration of sedation, tranquilizer, antihistamine, other medication, shaving of puncture site. Notes appropriate timing for medications to take effect.

vii) Checks whether all procedures have been carried out and at appropriate time and that all reports ordered are with patient's chart. If there is any problem, arranges to have procedures carried out, examination postponed to allow proper timing, reports problem to appropriate staff member, or plans to inform radiologist.

g. Depending on institutional procedures, notes whether performer is to set up equipment and/or prepare patient personally, or whether performer will join angiography team in examination room.

h. If referring physician has requested that prior films, ultrasonograms, scans and test results already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have these delivered.

i. If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to prepare properly, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radi-

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ologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

2. Performer prepares ahead so as not to keep patient in examination room longer than necessary. Determines what prior preparations will be needed, such as cleaning and preparation of equipment and accessories, proper dress, consultation with procedure room staff and rehearsal if so required. May carry out any or all of the following:

   a. Goes to appropriate room in the department for the type of examination involved and the equipment required, such as angiography suite or room assigned on requisition sheet.

      i) If serial and/or spotfilm magnification has been requested, performer may check that the machine(s) to be used have a fractional focal spot of appropriate size for direct magnification technique (i.e. 0.3 mm or smaller). Checks that changer, table and/or tube heights can be adjusted to obtain the distances needed for magnification.
      ii) May decide to clean x-ray equipment or arranges to have this done.
      iii) If appropriate, arrives for rehearsal of procedure and notes steps in relation to those of others on staff.
      iv) Washes hands as and when appropriate.

   b. Reviews the technique chart(s) for the unit(s) to be used (single or

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biplane serial changer(s), spotfilm and fluoroscopy unit).

      i) Locates information for the chest views likely to be required. Takes note of the exposure factors to be used for overheads, spotfilms and fluoroscopy. Considers preferences of the radiologist involved, conversions needed to account for patient's age, condition, presence of contrast. Notes any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).
      ii) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.
      iii) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

   c. Checks for appropriate film supplies:

      i) With serial changer(s) using roll film, performer checks that there is an adequate supply for examination loaded in changer(s) and that film is properly loaded.

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ii) With serial changers using cassettes, for cassette spotfilming, and for scout films, performer makes sure that an adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Checks that these are loaded with appropriate speed and type of film and grid combinations depending on the patient's size and area of interest, the type of equipment to be used, and institutional practices.

iii) If examination may include spotfilming using a camera (attached to image intensifier) and roll film, performer checks film supply indicator to make sure that there is sufficient film in the roll film cassette.
Checks film loading in subdued light; checks that end of film is cut correctly and is properly threaded and attached to take-up spool so that film unwinds appropriately. Checks that film is properly engaged in sprockets. Locks into operating position. If appropriate, cuts off excess film at exit port and removes. Attaches film cassette to camera and locks into place. Replaces camera cover. Advances film to compensate for any exposure of film due to installation or check. Removes dark slide from camera lens.

iv) If adequate film or cassette supply is not in room, arranges to obtain or decides to obtain and load personally.

v) Checks that equipment or device is available to number serial films, or checks that cassettes such as vacuum cassettes are prenumbered and are in numerical order.
May prepare identification strip using tape and lead numerals giving appropriate ID information for placement on table or on cassette(s).
May prepare for use of flashcard by checking that there is piece of lead on film holder surface. May write out ID information on card if not received with requisition for use with flasher or spotfilm device. Inserts in slot in spotfilm camera or sets aside for later use.
Checks identification against requisition sheet.
May place card as appropriate for use with automatic marking device.

vi) Makes sure that right (R) and left (L) markers are available for use. May tape R or L marker on image intensifier screen; may plan to tape to patient's body or on table or film changer.

d. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator(s) and checks that each indicator light shows that machine (s) is(are) "warmed up," or turns on main switch as appropriate to equipment and allows time for machine(s) to "warm up." Makes sure that all circuits have been stabilized. If appropriate, checks each line voltage meter and, if needed, turns compensator dial(s) until needle is aligned properly on line meter.

e. Performer sets up and checks fluoroscopy equipment:

i) Dons protective leaded rubber garments such as apron and

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gloves. Makes sure that no one is in examination room or control room.

ii) Sets x-ray generator mode selector to fluoroscopic mode.

iii) If not already done, performer connects TV monitor to power outlet. Turns on monitor and checks that "ready" light is on.

iv) If appropriate, performer selects the proper field size selector (if there is dual image intensifier).

v) Performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position.

vi) If a grid will be used with the image intensifier for fluoroscopy, performer positions and centers grid if not already done. May use control button or slides grid into position. May check that the grid is oriented toward the x-ray tube, with grid lines parallel to the long axis of the tube.

vii) May adjust distance between focal spot and image intensifier (focal spot to film distance, FFD). May check that TOD is 15 inches or more.

viii) Performer may collimate fluoroscopy tube depending on nature of

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the equipment and controls. May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic examination or may set shutter mode selector to automatic collimation.

ix) To check fluoroscopy mode, if not already done, performer places phantom or appropriate test object on radiography table where patient will be centered for examination.

x) Adjusts fluoroscopic tube stand (above or below table) so that tube is at zero degrees and centered to the area of interest. If not already done, moves image intensifier into position; centers (over or under) the area of interest.

xi) Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate.

xii) Views test object being fluoroscoped on TV monitor. Adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly. Checks mA meter and notes whether appropriate reading is obtained.

xiii) Checks that TV brightness controls are operating and adjusts for preliminary viewing.

xiv) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

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f. Performer sets up and checks spotfilm equipment:

i) If appropriate,sets mode selector for spotfilm use (camera or cassette device).

ii) Performer sets controls on image intensifier for spotfilm camera device by selecting and setting the rate (frames per second) for the camera according to standards set for examination.

iii) For cassette spotfilming,performer may insert cassette by using controls or manually pulling out spotfilm bucky tray and opening retaining clamps. Inserts cassette into bucky tray and pushes back. Moves cassette into appropriate "stored" position. Performer may select and set a standard spotfilm program providing for format combinations such as single, half, or quarter combinations depending on program appropriate for examination, or awaits orders from radiologist.

iv) If appropriate, performer selects and sets exposure factors for spotfilming.
For conventional manual exposure control, performer selects and sets the appropriate spotfilm time for the examination. For automatic, phototimed exposure control, performer selects a density exposure control appropriate for the examination. Performer selects the appropriate mA for the examination and the focal spot size to be used. Performer selects and sets kVp by combining settings on one major and one minor kVp selector as appropriate for the examination.

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v) If not already done, moves image intensifier and any spotfilm device into position; centers to the area of interest.

vi) May collimate x-ray tube used for spotfilming as appropriate. Manually sets collimator for the spotfilm field size to be used, or selects and sets field size control to be used for automatic collimation with programmed spotfilm cassette exposure sequence.

vii) To check spotfilm functioning, performer may move cassette or roll film into x-ray exposure field using appropriate controls. May activate controls for spotfilm exposure. Notes whether cassette or roll film transport is operating appropriately. Notes whether exposure is terminated by phototimer or, if manual timer, in time set. If appropriate, releases spotfilm control after exposure.
If equipment is operating appropriately, performer unloads cassette and reloads or advances roll film as appropriate. Moves bucky into appropriate stored position.

g. Performer may set up and check serial changer(s) as appropriate to equipment:

i) As appropriate, sets x-ray mode selector(s) for overhead filming.

ii) Depending on the type of film changer(s) and examination table to be used, performer may wheel see-through horizontal changer into position under angiography table, may place

List Elements Fully	List Elements Fully
changer so that patient may be moved to changer on radiolucent top after catheterization, or may place changer so that it may be placed under table after fluoroscopy. May set up changer in vertical position next to table for lateral filming or may roll equipment out of way. iii) May cycle each unit to check operation. If so, makes sure that anode is not rotating. h. Performer may set up and check automatic pressure injection equipment as appropriate to the type to be used. Checks that it is grounded. i. If performer decides that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used. j. Performer notes whether ECG and other cardiac monitoring equipment and emergency cart are present. Notes who will be assigned to monitor. k. May check that procedure tray for the examination has been properly prepared or decides to do personally i) Depending on radiologist's orders, performer may check for appropriate types and sizes of puncture needles, tourniquets, catheters, syringes, scalpels, guide wires, forceps, dressings. Notes whether appropriate antiseptic, saline, anticoagulant, and local anesthetic solutions are present. ii) Checks that appropriate aqueous iodine based contrast solution is present. Checks that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool.	l. Checks that proper accessories are available for procedure. i) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure, that any appropriate shielding is available for placement between radiologist and the patient. ii) Checks that appropriate immobilization devices for age of patient and type of procedure are present. iii) Checks that extension cones are available. iv) Checks for hospital gowns, masks, gloves to be worn for sterile procedure. May check for emesis basin and towels. v) May set up footboard, shoulder rests, hand holds on tilt table. 3. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, any prior films, scans, and lab reports to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready: a. If performer is to prepare patient in procedure room, may proceed as follows: i) Performer washes hands as appropriate. Depending on patient's

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condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.

ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room (wheeled on stretcher if patient has been sedated; escorted or carried if child or adult patient is to have general anesthesia after entering department).

iii) Performer greets a coherent patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet, referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.

iv) Has patient positioned or makes patient comfortable on examination table or on table-top over changer. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to table.

If patient is in wheelchair,may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.

Performer may decide to assist patient to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.

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If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.

May have nurse carefully place young patient in supine position on table, or lifts patient carefully, supporting patient's head, and places on table.

v) Makes sure patient is being attended and there is no danger patient will fall off table. If patient has respiration, cardiac or infusion equipment or urinary catheter attached, makes sure that equipment is being monitored and is not dislodged.

vi) Checks that patient is in gown, with all jewelry removed; may check that patient is being kept warm.

vii) If not already done, may question patient or accompanying staff member about any prior preparations and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

viii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

ix) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

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- x) Answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning or degree of coherence. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.
- xi) Notes the patient's body type, whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points will be easy to find. For adult female notes whether breasts are large and pendulous. If so, may have staff member draw the breasts to the sides and hold in place with wide bandage.
- xii) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the body at the level(s) and in the direction(s) in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors. After measuring, has patient rest in as relaxed a position as possible.

b. Performer may inform attending radiologist when patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films and scans to radiologist. Displays radiographs on view boxes.

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- i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.
- ii) Performer may accompany radiologist to examination room, greet and/or introduce patient and staff members.

c. If not already done, performer joins radiologist, patient and other staff in examination room.

d. During radiologist's review of requisition, prior radiographic materials, and examination of patient, performer notes radiologist's orders:

- i) If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.
- ii) If radiologist decides to proceed, notes orders for scout film(s) including the patient position, projection, area of interest, centering, and phase of suspended respiration. If biplane scouts are requested, notes whether alternating or simultaneous exposure is required.
- iii) May provide hospital gown, gloves, mask to radiologist.
- iv) Provides leaded apron and gloves to radiologist. Provides patient and anyone who will remain in room during exposure with appropriate protective

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shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

4. Performer makes preliminary scout film(s) as ordered after making sure that patient is being attended. Sets up equipment for the examination before positioning and immobilizing patient:

   a. Performer sets up equipment depending on whether film changer or cassette will be used.

      i) If performer will use single or biplane changer for AP and/or lateral projection, sets changer(s) for manual control so that only one scout exposure will be made. Loads changer(s) with appropriate cassette or operates film transport.
      ii) If performer will use cassette (s), selects cassette of appropriate size and places on table for centering to patient's chest. For lateral scout with patient supine, places cassette in vertical cassette holder on side of interest.

   b. Performer attaches appropriate identification information:

      i) May place right or left marker on cassette as appropriate to the study and projection or depresses appropriate R or L button for automatic marking. May tape R or L marker to patient's body.

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      ii) May place identification information on appropriate corner of cassette; may set flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette; may place patient's card into card tray for equipment using automatic film marking device.

   c. Performer sets the technical factors for the scout film (or AP and lateral projections if scout biplane views are ordered).

      i) Performer selects the exposure factors for the preliminary scout projection(s) as described, taking account of the measurements taken of the patient.
      ii) Sets control panel(s) for radiography mode and, as or if appropriate, for simultaneous or alternating exposures for biplane equipment.
      iii) For each projection selects milliamperage and chooses selectors for the correct focal size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.
      iv) Depending on the equipment, may set controls to provide for manual tableside adjustment of collimator, table and x-ray tube height and position (unless these have already been set).
      v) Performer may set the focal-film distance(s) if not already done. Operates controls or manually moves the x-ray

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tube(s) into place. Checks each focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

d. Performer prepares patient for final positioning:

i) Places patient in supine position on table over changer (or cassette). Arranges patient so that median sagittal plane of body is centered to midline.

ii) For single or biplane lateral projection plans to maintain patient in supine position. Positions vertical changer (or cassette in vertical holder) at right angles to table on the side of interest.

iii) Depending on patient's age and condition, performer may obtain help in positioning and immobilizing patient. May explain to staff member what is required.

iv) With very young patient performer may have patient immobilized, or personally extends arms, placing them along sides of head, next to the ears. May apply a sleeve made of a diaper, towel, pillowcase or orthopedic stockinet to hold arms so that sleeve holds arms above and behind head, one at each side. May apply a sleeve of stretch gauze or bandage to the pelvis. Wraps lightly to maintain patient in position.

v) If patient has a balloon catheter or IV drip in place, is careful not to dislodge apparatus. Makes sure that no radiopaque part is lying over an area to be exposed, or that patient is not lying on a clamp.

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vi) Arranges patient's body so that median sagittal plane is centered to the midline. Arranges shoulders so that they lie on a single transverse plane. Centers film to part and keeps long axis parallel to film. Keeps median sagittal plane of patient's head vertical to avoid rotation of the thorax.

e. For projections of the chest, performer notes side and area of interest.

i) For an AP supine projection (posterior view) of the chest, performer has patient assume supine position. May elevate thorax. May place patient's arms above head as described or at sides with elbows elevated. May elevate patient's knees and place restraining band across legs. Centers film to median sagittal plane at the level of the sternal angle (for pulmonary arteries). Centers to the midsternum for the heart. Directs central ray vertically at right angles to midpoint of film.

ii) For a lateral supine projection of the chest, performer centers cassette in vertical holder to the thorax, with the midaxillary line of the body somewhat posterior to midline of film. For pulmonary arteries, directs central ray horizontally at right angles to film, centered to the fourth thoracic vertebra; for heart centers to the sixth or seventh thoracic vertebra.

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f. If not yet completed, performer immobilizes patient in position:

- i) May place restraining bands, strips of gauze, and adhesive tape as needed. May use head clamp. Avoids use of compression band across abdomen or chest.
- ii) May check that there is no rotation of thorax.
- iii) After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.
- vi) Checks final positioning using light in collimator. Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows as reference for center of field, and uses the collimator light to center the tube to the part or film.
- v) Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube to provide better centering.

g. Once the patient has been positioned and immobilized, performer adjusts the collimator so as to expose only the area of interest as defined by radiologist.

- i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.
- ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

h. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination. Makes sure that anyone remaining in room is supplied with lead gloves and apron and stays out of central beam, especially horizontal beam.

i. Performer may rehearse coherent patient in breathing out and holding or breathing in and holding, depending on orders, or observes patient's breathing and plans exposure for the appropriate quiet phase.

j. Performer makes the exposure:

- i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.
- ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. Performer tells the patient when to hold breath as rehearsed or observes patient's breathing and times exposure to the appropriate quiet phase required.
- iii) Performer initiates exposure by pressing hand trigger or exposure control button (or appropriate control for simultaneous or alternating biplane exposure).
- iv) While exposure is underway, performer may check that mA meter records appropriate current as set, that kVp meter dips slightly.

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- v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
- vi) After exposure is completed, tells patient that he or she can relax. Returns to patient. Removes the cassette(s) or exposed film as appropriate for processing. Removes any markers from cassette(s) for further use.

k. If single plane scout films in both AP and lateral projections are ordered (and if biplane equipment was not used), performer maintains patient in same position; proceeds with right angle projection as described, using appropriate technical factors.

l. Performer arranges to have the scout film(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

- i) While film(s) are being processed, makes sure that patient is comfortable and attended by staff person or self.
- ii) Performer brings the processed scout film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist when the radiograph(s) are ready. May place prior films for viewing as well.

5. During radiologist's review of the scout film(s) performer notes radiologist's orders:

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a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.

b. Performer notes whether radiologist requires a change in technical factors and/or patient positioning, centering,or central ray angulation for later serial filming.

- i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.
- ii) Notes whether any problem with technique is due to performer's own lack of attention,malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

c. If radiologist will proceed, performer notes the final site selected for puncture; if antecubital vein, notes whether a cutdown will be performed or percutaneous entry. Notes whether general anesthesia will be used.

d. Notes orders for additional preparation of patient such as sedation, IV drip or transfusion, shaving of puncture site, if not already done.

e. Notes final orders on materials (based on puncture site and the planned location of catheter tip for injections), such as types and sizes of puncture needle, catheters, guide wires, type and amount of contrast, settings for pressure injector.

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f. Notes whether serial filming will be done first and/or spotfilming.

   i) With serial filming, notes whether single or biplane, with or without magnification.
   ii) With biplane serial filming, notes whether simultaneous or alternating exposures.
   iii) With serial filming notes the radiologist's orders for serial program to visualize the desired circulatory phases. Notes the number of exposures and sequences, rate per second, and intervals between sequences. Notes number of injections such as one for AP, one for lateral projections, unless biplane equipment will be used. Notes phase of respiration for exposure.
   iv) If computer program(s) are to be used for serial filming (giving the number of films to be taken, per second intervals, number of separate series, and possibly a program to coordinate with automatic pressure injection), performer arranges to have keypunch control card prepared or delivered and checked, or decides to do personally. When control card(s) are ready, performer places as appropriate in control panel of computer.
   v) With spotfilming, notes the spotfilm program such as frames per second and/or format for cassette spotfilm program.
   vi) With magnification for seriography or spotfilming, notes degree of magnification ordered.
   vii) Discusses sequence and timing of procedure with radiologist. May arrange signals for exposure, changing of spotfilm cassettes, operation of fluoroscopic and/or serial exposure controls.

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6. Performer carries out preparations for angiography as ordered by radiologist, based on the part of the work for which performer will be responsible. May carry out any or all of the following:

   a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray. May assist in preparation of catheters, puncture needle, syringes containing saline solution, local anesthetic, anticoagulant, contrast solution, using sterile technique. Notes or checks amounts ordered. Checks contrast for signs of chemical deterioration.
   b. If performer will be responsible for filming, prepares ahead for fluoroscopy, spotfilming, automatic injection (including computer controlled), and serial filming (single or biplene):

      i) May reset technical factors for fluoroscopy spotfilming and/or serial filming based on radiologist's review of scout film(s) and the presence of contrast.
      ii) If appropriate, changes or adjusts program for spotfilming.
      iii) Sets programs for serial changer(s), automatic injector as appropriate. Checks that planned exposure time does not exceed available capacity of unit. If not already done and computer program will be used, checks keypunch control card and places in computer control panel.

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iv) Performer may load cassette changer(s) with proper number of vacuum or other type of cassettes as ordered. (If appropriate,loads cut film changer or roll film changer.) If the same changer will be used for lateral and AP projections, loads only enough cassettes for series in the first projection,to avoid artifact caused by shadow from last exposure in one position on the first cassette to be used in next position. If biplane changers are to be used, loads changers as appropriate for simultaneous or alternating exposures.

v) Performer may set up equipment for automatic marking of films in numerical sequence or records cassette numbers for the sequence.

vi) Depending on equipment, performer may wheel serial changer(s) out of the way until fluoroscopy is completed; may make sure that everything is ready to lift patient from examination table on radiolucent table top to horizontal serial changer after fluoroscopy.

vii) For automatic pressure injection may attach tubing to syringe containing contrast solution using sterile technique. Attaches to machine and mounts syringe as appropriate. Checks that there are no air bubbles and that machine is on "stand-by." If automatic injection is not computer controlled, sets flow rate dial for the cc's per second as ordered by radiologist. When ordered by radiologist, sets pressure control as designated.

viii) For computer controlled seriography, plugs synchronization cable from control unit into appropriate receptacle on the x-ray control panel.

ix) For serial filming using magnification technique performer removes grid from changer. Determines the degree of magnification requested. If the request is expressed as an area magnification, performer determines the linear magnification by taking the square root. (Linear magnification squared equals area magnification.) Adjusts the height of the horizontal table or changer top and/or x-ray tube so that the ratio of the focal-film distance (FFD) to the focal-object distance (FOD), (FFD divided by FOD), is equal to the desired degree of magnification. For a two-times linear magnification simply sets the FOD equal to the OFD (object-film distance).
Adjusts the collimation to correspond to the field size anticipated (for the FOD involved). If the sum of the new FOD and OFD (FFD) is now different from the FFD used for non-magnification technique, performer may consult technique chart to note the factor to use for a compensatory change in mAs. May also note the change in kVp and mAs necessary to compensate for any change in collimation from non-magnification technique. Consults appropriate chart for conversion factors. May record. Performer resets technical factors as appropriate.

x) For magnification with spotfilming, checks that spotfilm device can be raised to appropriate height from table.

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c. If performer is to assist with preparation of patient for catheterization, washes hands observing sterile technique when appropriate.

   i) May assist or stand by as patient preparations such as medication, transfusion are administered.
   ii) If not already done, may arrange to have puncture site shaved and prepared.
   iii) Performer may position patient for access to puncture site; places patient in supine position on x-ray or angiography table.
   iv) For a femoral vein puncture, abducts patient's legs and exposes the femoral vein on the side to be punctured just below the inguinal ligament. May rotate thigh externally and immobilize.
   v) For a left antecubital vein puncture or cut-down, supports extended left arm and exposes cubital area. May assist with application of tourniquet.
   vi) For a right subclavian vein puncture, assists patient in raising and lowering head to facilitate location of puncture point. Exposes the area above the first rib, at and below the right clavicle, at the junction of the medial and middle third of the right clavicle.
   vii) For a right internal jugular vein puncture, has supine patient extend head. May position table in Trendelenburg position to distend neck veins. Makes sure shoulders are not elevated. Exposes an area just below the angle of the mandible at the carotid pulse. May assist with application of a sling of sterile plastic tubing by looping about neck loosely so that radiologist can tighten to occlude vein.
   viii) For a left axillary vein puncture, abducts left arm and rotates hand so that palm faces upward and forearm is parallel with patient's head. Exposes pectoral muscle fold or other site as ordered.
   ix) Immobilizes patient as appropriate. May adjust shoulder supports; may use wrist restraints.
   x) May swab puncture site area with antiseptic solution and cover surrounding area with sterile towels.

d. If appropriate, may make sure that ECG monitoring leads have been applied, or decides to do personally. Checks that staff is assigned to monitor ECG and other vital signs. Makes sure that someone is assigned to take and record pressure readings.

e. Informs radiologist when patient and materials are ready.

f. If not already done, provides radiologist with lead shielding, gloves, sterile gown, gloves, mask. Makes sure that patient and everyone to remain in room is properly shielded; may place lead screen in place if radiologist will remain near patient.

g. May receive or obtain a clean hospital gown, cotton "boots," cap and mask. Dons these before approaching sterile area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids touching patient, drapes, radiologist, nurse, or instrument table with non-sterile object.

h. If patient is to have general anesthesia, and/or cut-down proce-

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dure, performer awaits signal that procedure can begin.

i. During injection of local anesthetic, puncture, placement of needle and advancing of catheter, performer assists as appropriate:

   i) May hand materials and supplies asked for using sterile technique. Removes tourniquet when ordered.
   ii) May assist with fluoroscopic viewing of needle and progress of catheter placement. On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders. Continues as ordered.
   iii) Performer may operate tilt table on orders from radiologist, or assists in positioning patient as ordered. Continues as ordered.
   iv) May assist with attachment of syringe to flush catheter, inject anticoagulant, syringe to inject contrast solution for fluoroscopic check of catheter position.
   v) Repeats as appropriate while radiologist continues to advance catheter, replace dilator catheter with injection catheter, make pressure readings; repeats for alternative puncture site.
   vi) Once catheter position is judged satisfactory, performer may tape into position, maintaining sterile field.
   vii) May assist with attachment of manometer and recording of pressure within right atrium, right ventricle, and/or main pulmonary artery.
   viii) Notes final orders on sequence to follow, including patient positions, projections, collimation, centering, rate and pressure for automatic injector. Makes any last minute changes as appropriate.

7. Performer assists and coordinates filming with injection of contrast as appropriate to injection site, area, side of interest, and nature of pathology, as ordered:

   a. May assist in positioning patient on table or over changer for serial filming:

      i) May assist in moving patient on table top to horizontal changer.
      ii) May roll horizontal and/or biplane changer(s) into position under and/or beside angiography table for AP and/or lateral projections.

   b. Positions patient or assists radiologist in positioning:

      i) For AP and/or lateral projection for serial filming (and for PA projection for fluoroscopic spotfilming) performer positions patient in supine AP position as described.
      ii) For horizontal beam posterior oblique or anterior oblique projections performer may position lateral changer on appropriate side of patient. Tilts table or positions patient to obtain the desired angulation in relation to film. Depending on area of interest, may position patient before each injection, including as ordered, right and/or left PA oblique projections (for anterior

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views) and right AP oblique projection (for right posterior view):

- iii) For a right posterior oblique projection using a lateral changer and horizontal beam, performer rotates patient or table so that anterior of patient is facing the film, patient is resting on left side and right side is raised and rotated so that it is resting against the film surface at the selected angulation. Raises left arm over head to clear central ray. Directs central ray horizontally to the side of interest or to the midline. Centers to the level of the fourth thoracic vertebra for pulmonary vessels and to sixth thoracic vertebra for projection of the heart.
- iv) For a right anterior oblique projection, performer reverses the positions of the film changer and the central beam so that the beam enters the anterior surface, centered to the level of the sternal angle for pulmonary vessels and to the midsternum for the heart.
- v) For a left posterior oblique projection performer positions patient or table so that the left side is closest to film, with patient lying on left side, and right side elevated to desired angulation. Positions equipment and centers as appropriate as in (iii), above.
- vi) For vertical beam oblique projections performer centers film in changer under patient. Elevates appropriate side, and directs central ray at right angles to film as appropriate.
- vii) May position patient for AP oblique projection using horizontal changer and vertical beam and for PA oblique spotfilming projections without changing patient's position.
- viii) Performer may substitute right PA oblique projection for left AP oblique projection, and left PA oblique projection for right AP oblique projection as appropriate, taking account of the patient's position on table and the capabilities of the equipment.

c. Performer checks that serial changer(s) are loaded, locked and ready. Centers and adjusts the x-ray tube(s) angulation as appropriate. Centers film in changer(s) to the specified area of interest as described, and collimates to the smallest possible exposure area. Checks patient's shielding.

d. Depending on whether injection is to be initiated by radiologist or will be computer controlled, performer starts the serial film changer(s) on signal from the radiologist or initiates the computer control of the injection and serial exposures at the control panel.

e. With fluoroscopy and spotfilming performer may operate tilt table on orders from radiologist, may operate exposure controls as ordered. If spotfilm attachment uses cassettes, performer may unload as used, identify and insert additional cassettes, as described.

f. If additional injections and serial exposures or spotfilms are ordered before the first series are to be viewed, such as right angle or oblique projections, and if biplane equipment is not being used, performer repositions and centers equipment as appropriate.

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   i) Resets technical factors for the projections involved if required; repeats collimation, shielding and coordination of injection and making exposures as described.
   ii) If one single-plane changer is being used, reloads changer with cassettes or adjusts roll or cut film transport for additional serial projections. Sets up as described earlier.

g. Performer has the serial films and/or spotfilms processed at once or decides to do personally.

   i) For serial films makes sure that each exposure is numbered for appropriate order in sequence.
   ii) With spotfilm camera, performer advances the film so that all exposures made will be wound on the take-up spool in the roll film cassette. May replace dark slide on camera lens. Uses device to cut film and create a light shield. Resets counter and removes film cassette.
   iii) With cassette serial or spotfilms, removes any markers for further use. Attaches ID card for use with flasher if appropriate.
   iv) May sign or have radiologist sign requisition sheet.
   v) When the serial films and/or spotfilms have been processed, performer may place on view boxes with biplane frontal and lateral views together and in appropriate serial order. Notifies radiologist when they are ready. May hang prior films and scout(s) as well.

h. Throughout procedure performer remains alert to any symptom of adverse reaction of patient to procedure. Brings any emergency sign to attention of radiologist.

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8. While the radiologist reviews the first angiograms performer notes radiologist's decisions on how to proceed with examination and orders for any continuation:

   a. Performer notes whether the initial injection will be repeated with a change in technical factors, amount of contrast, pressure, and/or change in position, such as oblique projections. Notes any orders for magnification and/or spotfilming.
   b. Performer notes whether radiologist will selectively catheterize the right and/or left pulmonary artery or proceed to subselective catheterization in a lobar segment.

9. Performer carries out additional steps as appropriate:

   a. If radiologist decides to repeat any exposures, performer resets technical exposure factors, pressure settings, etc., as required and repeats appropriate steps.
   b. If radiologist orders additional views, performer makes any changes in x-ray tube position, angulation and/or position of serial changer and/or position of patient or table as appropriate.

      i) Centers, collimates and provides shielding as appropriate.
      ii) Carries out steps for magnification or spotfilming as described.
      iii) Repeats filming in coordination with injection as described. Repeats processing of films and placement for review.

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c. If radiologist is to carry out main branch or subselective pulmonary arteriography, performer assists as appropriate:

   i) Assists with materials and fluoroscopy while radiologist repositions catheter and checks positioning in vessel.
   ii) Notes orders on single or biplane serial filming, magnification technique, spotfilming, pressure injection, centering, positioning, collimation as appropriate and carries out as described.
   iii) For each set of serial or spotfilms performer resets technical exposure factors, pressure settings, etc., as required, and repeats appropriate steps for collimation, shielding, centering serial changer(s) and x-ray tube(s), setting angulation, making exposures, processing, and presenting for review as described.
   iv) Repeats as appropriate for each vessel to be opacified and awaits further orders.

d. Performer shows subsequent sets of spotfilms and/or angiograms to radiologist as processed, and proceeds as described above until radiologist indicates that examination is completed.
e. Performer assists as appropriate while radiologist pulls catheter back through ventricle and/or right atrium with monitoring or pressure readings taken.

10. When informed by the radiologist that the radiographic examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

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a. May assist while radiologist removes connecting tubes, syringes, and catheter. Removes any markers from patient's body.
b. May prepare to apply light pressure to venous puncture site when ordered. May prepare to apply pressure dressing to puncture site after manual pressure has been applied.
c. Performer coordinates with anesthesiologist if present and/or other staff members responsible for recovery and after-care of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room.
d. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders additional examination and/or delayed scout of abdomen or tests.
e. Performer records the examination according to institutional procedures. May include date, room, examination type, the serial overhead views and any spotfilms taken, the technical factors used, and film sizes. May record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet.
f. Performer may record the fluoroscopic exposure including exposure time and rad dosage from posted data.
g. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally,

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depending on institutional arrangements. Makes sure that any nondisposable guide wires and catheters are cleaned and flushed immediately after use and before sterilization. h. Performer may return accessories such as computer control cards and immobilization devices to appropriate locations or has this done. i. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or has this done, depending on institutional procedures. j. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed;pt. reassured, measured;films identified;technical factors selected,set for fluoroscopy,cine;scout films taken;radiologist assisted with puncture,catheterization;pt. and equipment positioned,set up for hand and/or automatic injection, single or biplane serial filming,cine,videotaping; filming coordinated with injection;films sent for processing,radiologist's review;procedures repeated, continued as ordered;examination recorded;angiograms placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,bracelet,medical-technical history,prior films;view boxes;pen; computer control panel,cables,keypunch cards;gowns, gloves,masks;technique,standard view,tube rating, rad exposure charts;phantom;x-ray generator(s),tube (s),control panel(s),extension cones;fluoroscopy unit,TV monitor,image intensifier;cassettes;shielding;collimator(s);serial changer(s); angiography table;cine camera,film,projector,screen;videotape device(s);ECG monitoring equipment,manometer,stopcock,transducer;R-L,ID device or markers;automatic injector;immobilization devices;tape;emergency cart; sterile procedure tray for puncture,catheterization; antiseptic,saline,anticoagulant,vasolidator,local anesthetic,iodine based contrast,disinfectant solutions;swabs,drape,syringes;stretcher;wheelchair;calipers

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.;radiologist;anesthesiologist;nurse;co-worker; cardiologist;cardiac team

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking percutaneous coronary arteriograms and/or left ventriculograms of any pt.,by reviewing request; measuring,reassuring pt.;setting up for fluoroscopy, single and/or biplane serial filming,cineradiography, videotaping,manual and/or automatic pressure injection;making scout films;assisting with sterile puncture,catheterization,fluoroscopy,cine,videotaping; identifying films;applying shielding;collimating;setting technical factors;positioning,immobilizing pt.; coordinating serial exposures with injections;having films processed,reviewed;repeating,adjusting as ordered;placing angiograms for use;recording exam.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a patient scheduled for left ventriculography and/or coronary arteriography (contrast study of the left ventricle of the heart and/or coronary arteries by means of percutaneous catheterization) as result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

Depending on institutional arrangements, performer may also receive prior film(s).

1. Performer reads the requisition sheet to determine the examination called for, the patient involved, special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the examination called for, the purpose, and the areas involved:

      1) Notes side of interest, whether nonselective or selective coronary arteriography has been suggested, whether procedure will involve

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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left heart ventriculography. For selective coronary arteriography notes whether left and/or right coronary artery is to be examined.

ii) Notes selected puncture site, whether general anesthesia has been suggested.

b. Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is emergency patient.

c. Notes name of radiologist in charge, names of other staff members to assist, such as cardiac team to monitor ECG, vital signs, arterial and cardiac pressure, anesthesiologist, surgeon, cardiologist. Notes examination room, time scheduled, and whether or when performer is to report for preliminary preparations.

d. Performer notes orders on equipment and materials:

i) Notes whether cineradiography and videotaping equipment has been ordered, whether single or biplane (for ventriculography).

ii) Notes whether serial film changer(s) have been ordered, whether single or biplane, whether using cassettes, roll film, cut film, whether serial unit has cine capabilities. Notes whether unit(s) are computer controlled, whether AP unit will be needed or only lateral unit. Notes whether cine will be used in vertical plane and serial filming in the horizontal plane.

iii) Notes type of angiography table to be used, whether patient will be moved into position on table or whether table or rotating cradle will be tilted

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to various degrees of obliquity.

iv) Notes the variety of catheter types, sizes and lengths to provide, radiopaque or radiolucent, with or without sideholes, preformed right and left coronary, loop,and/or pigtail catheters. Notes size and type of safety guide wires, puncture needles.

v) Notes type and amount of iodine based contrast solution,whether automatic and/or hand pressure injection will be used.

vi) Notes orders for type and amount of antiseptic, anticoagulant, local anesthetic, saline and vasodilator solutions.

vii) Notes orders for monitoring, life support and emergency care equipment.

e. Performer considers the accessory equipment, technical factors, shielding and immobilization equipment appropriate for the patient's age, sex, size, condition, the examination ordered and the equipment to be used:

i) May check that the type of equipment ordered is available in examination room assigned. If general anesthesia may be given, may check that x-ray equipment is compatible for use with anesthesia equipment.

ii) Notes appropriate sterile procedures required, appropriate shielding for the examination.

iii) Notes whether film processing equipment is available adjacent to procedure room.

iv) Checks own clothing to make sure that performer is in compliance with institutional rules for safe, sanitary dress for the equipment and room to be used.

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f. Performer notes relevant information about the patient's history and orders for prior preparation:

  i) Notes whether patient has prior history of allergic reaction to contrast or history of allergies. Notes whether allergy test has been ordered and, if so, results.
  ii) Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.
  iii) Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done at institution or elsewhere in recent past, whether history of extensive radiography should be reported to radiologist.
  iv) Notes how patient will arrive for examination (whether in wheelchair, on stretcher, accompanied by staff,whether patient will be coherent,already sedated).
  v) Notes any special information on patient's condition that could affect positioning, immobilization, handling, or selection of technique, such as respiratory disease, communicable or infectious condition, presence of IV drip, behavioral disorder.
  vi) Performer notes whether there are orders on prior preparation of patient such as therapeutic diet, cessation of oral contraceptive, allergy or lab tests, prior abstinence from morning meal, start of IV drip, prior administration of sedation, tranquilizer, antihistamine, other medication, shaving of puncture site. Notes appropriate timing for medications to take effect.
  vii) Checks whether all procedures have been carried out and at appropriate time, and that all reports ordered are with patient's chart. If there is any problem, arranges to have procedures carried out, examination postponed to allow proper timing, reports problem to appropriate staff member, or plans to inform radiologist.

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g. Depending on institutional procedures, notes whether performer is to set up equipment and/or prepare patient personally, or whether performer will join angiography team in examination room.

h. If referring physician has requested that prior films, ultrasonograms, scans and test results already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have these delivered.

i. If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to prepare properly, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Ex-

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plains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

2. Performer prepares ahead so as not to keep patient in examination room longer than necessary. Determines what prior preparations will be needed, such as cleaning and preparation of equipment and accessories, proper dress, consultation with procedure room staff, and rehearsal if so required. May carry out any or all of the following:

   a. Goes to appropriate room in the department for the type of examination involved and the equipment required, such as angiography suite, or room assigned on requisition sheet.

      i) May decide to clean x-ray equipment or arranges to have this done.
      ii) If appropriate, arrives for rehearsal of procedure and notes steps in relation to those of others on staff.
      iii) Washes hands as and when appropriate.

   b. Performer reviews the technique chart(s) for the unit(s) to be used (single or biplane serial changer, single or biplane fluoroscopy units with cine and videotape recording devices).

      i) Locates information for the chest views likely to be required. Takes note of the exposure factors for serial and/or cine filming with fluoroscopy. Considers the preferences of the radiologist involved, conversions needed to account for patient's age, condition, presence

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of contrast. Notes any newly posted changes in technical factors (to reflect accommodation to a change in machine output or a policy decision).
      ii) If a conversion of factors will be needed, looks up numerical conversion factors and calculates, or uses conversion chart to ascertain the appropriate new exposure factor. Multiplies, divides, adds, or subtracts as appropriate.
      iii) Checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on appropriate tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs, minimizing exposure time.

   c. Checks for appropriate film supplies:

      i) With serial changer(s) using roll film, performer checks that there is an adequate supply for examination loaded in changer(s) and that film is properly loaded.
      ii) With serial changer(s) using cassettes and for scout films, performer makes sure that adequate supply of loaded cassettes of the appropriate types and sizes are available in the examination room. Checks that these are loaded with appropriate speed and type of film and grid combinations depending on the patient's size, area of interest, the type of equip-

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ment to be used, and institutional practices. If adequate supply is not in room, arranges to obtain or decides to obtain personally.

iii) If examination will include use of single or biplane cineradiography camera (attached to image intensifier) performer checks the amount of unexposed film remaining in the cine camera film magazine(s). If appropriate, arranges to have film magazine(s) loaded with film or decides to do personally (in darkroom). Attaches loaded magazine to each camera by aligning and engaging film drive couplings. Slides in magazine until engaged; locks into position. Adjusts film and checks operation of film transport. Closes camera door and locks. Advances film as appropriate onto the take-up spool.

iv) If examination will include use of single or biplane videotape, performer sets up magnetic tape cassette(s) or video disc scanner (s) for recording of image directly from the television monitor(s). Makes sure that there is sufficient tape.

d. Makes sure that right (R) and left (L) markers are available for use and patient identification cards or leaded numerals or markers.

i) May tape R or L marker on image intensifier screen; may plan to tape to patient's body or tapes on table.

ii) May check that equipment or device is available to number serial films, or checks that cassettes such as vacuum cassettes are prenumbered and are in numerical order. May prepare identification strip using tape and lead numerals giving appropriate ID information for placement on table or cassette(s).

iii) If not already done, may prepare card for identification of the serial or cine film. Writes out or types appropriate patient identification information. Inserts identification card in cine camera or serial changer in appropriate slot so that each frame will bear the ID information, or places other ID marker as appropriate for other type of ID recording device.

e. Performer makes sure that x-ray equipment is ready for use. Goes to control panel(s) for x-ray generator(s) and checks that each indicator light shows that machine (s) is (are) "warmed up," or turns on main switch as appropriate to equipment and allows time for machine(s) to "warm up." Makes sure that all circuits have been stabilized. If appropriate, checks each line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.

f. Performer sets up and checks fluoroscopy equipment:

i) Dons protective leaded rubber garments such as apron and gloves. Makes sure that no one is in examination room or control room.

ii) Sets x-ray generator mode selector(s) to fluoroscopic mode.

iii) If not already done, performer connects TV monitor(s) to power

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outlet(s). Turns on each monitor and checks that "ready" light is on.

iv) If appropriate, performer selects the proper field size selector(s) (if there is dual image intensifier).

v) For each unit (AP and lateral if biplane) performer selects and sets exposure factors for fluoroscopy. Selects and sets the kVp at standard setting for the examination. May check indicator dial. With automatic density control, sets density selector as appropriate for examination. If mA is automatically controlled according to patient thickness, performer turns fluoroscope mA selector to maximum standard position. If not automatically controlled, sets as appropriate for focal spot size and examination involved. Sets fluoroscopic examination timer to maximum position.

vi) May adjust distance between focal spot and image intensifier (focal spot to film distance, FFD) for each tube. May check that TOD is 15 inches or more.

vii) Performer may collimate fluoroscopy tube(s) depending on the nature of the equipment and controls. May adjust fluoroscopy beam shutters to the field size anticipated for fluoroscopic viewing and/or cine recording or may set shutter mode selector to automatic collimation.

viii) To check fluoroscopy mode if not already done, performer places phantom or appropriate test object on examination table where patient's chest

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will be centered for examination.
Adjusts fluoroscopic tube stand (s) so that each tube is centered to the area of interest.
If not already done, moves image intensifier into position; centers to the area of interest.
Turns on TV power switch controls as appropriate. Activates fluoroscope exposure by pressing footswitch or as appropriate. Views test object being fluoroscoped on TV monitor.
Adjusts kVp control (and mA control if appropriate) and observes effects on TV monitor to be sure that equipment is operating properly.
Checks mA meter and notes whether appropriate reading is obtained.

ix) Checks that TV brightness controls are operating and adjusts for preliminary viewing.

x) Checks examination timer by noting whether time elapse indicator moves during exposure showing decreasing time left for examination. May check that exposure is terminated when maximum examination exposure time is reached.

g. Performer may set up and check cine and video equipment:

i) Sets mode selector(s) to cineradiography mode.

ii) As appropriate, selects and sets exposure factors for cine filming. If standard procedure calls for constant exposure timing per frame, selects and sets appropriate time in milliseconds.

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If standard procedure calls for constant average density, selects the appropriate density control setting as appropriate to examination.

Selects and sets a combination of one major and one minor kVp setting to obtain appropriate kVp for examination.

Sets appropriate mA for the examination and focal spot size to be used.

iii) Sets videotape controls to record position.

iv) To check operation of cine and videotape equipment, performer may start anode rotation. Activates appropriate exposure switch(es) for cine and video exposure(s), and checks that cine film take-up(s) are functioning appropriately. Shuts camera(s) after testing and advances film as appropriate.

Prepares and checks video replay mechanism(s). Resets controls to record position.

h. Performer may set up and check serial changer(s) as appropriate to equipment to be used:

- i) As appropriate, sets x-ray mode selector(s) for overhead AP and/or lateral filming.
- ii) May wheel single or biplane changers into position if mobile units are to be used.
- iii) May cycle each unit to check operation. If so, makes sure that anode is not rotating.
- iv) Moves changer(s) out of way or positions unit(s) for scout filming as appropriate.

i. Performer may set up and check automatic pressure injection equipment as appropriate to the type to be used (if any). Checks that it is grounded. May check table height and angle motor-controls.

j. Depending on the type of ECG recording, and whether cine filming and/or automatic injection will be synchronized with ECG monitoring equipment, performer may link ECG equipment to cine and/or injection equipment, check functioning, or arranges to have this done at appropriate time.

k. If performer determines that any of the equipment is not functioning properly, performer informs appropriate staff member. Arranges for alternate unit to be used.

l. Performer checks that all monitoring equipment ordered is present, that emergency cart and resuscitation equipment is present. Notes who will be assigned to monitor ECG, peripheral arterial and cardiac pressures.

m. May check that procedure tray for the examination has been properly prepared or decides to do personally:

- i) Depending on radiologist's orders, performer may check for appropriate types and sizes of puncture needles, range of catheters, syringes, scalpels, guide wires, forceps, dressings. Notes whether appropriate antiseptic, saline, anticoagulant, vasodilator, and local anesthetic solutions are present.
- ii) Checks that appropriate aqueous, iodine based contrast solution is present. Checks that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool.

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n. Checks that proper accessories are available for procedure:

- i) Checks that appropriate shielding is available for patient, radiologist, and anyone who will remain in the room during exposure, that appropriate shielding is available for placement between radiologist and the patient.
- ii) Checks that appropriate immobilization devices for adult or child and type of equipment are present.
- iii) Checks that extension cones are available.
- iv) Checks for hospital gowns, masks, gloves to be worn for sterile procedure. May check for emesis basin and towels.
- v) May set up footboard, shoulder rests, hand holds on examination table.

3. Depending on institutional procedures, performer may bring requisition sheet, patient's chart, any prior films, scans, and lab reports to radiologist; may bring or escort patient and accompanying staff members to examination room; and/or may join radiologist and patient after informing radiologist that equipment is ready:

a. If performer is to prepare patient in procedure room, may proceed as follows:

- i) Performer washes hands as appropriate. Depending on patient's condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.
- ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room (wheeled on stretcher if patient has been sedated; escorted or carried if child or adult patient is to have general anesthesia after entering department).
- iii) Performer greets a coherent patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet, referring to hospital identification bracelet or other identifier. Checks with accompanying staff member on any special precautions necessary during procedure.
- iv) Has patient positioned or makes patient comfortable on examination table. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to table. If patient is in wheelchair, may move patient in chair into position next to table. Makes sure that wheelchair is in locked position.
  Performer may decide to assist patient to table or has this done. May obtain help. Makes sure that no equipment is in the way that may be collided with by patient.
  If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards

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on stool, and then sit and/or lie on table.

May have nurse carefully place young patient in supine position on table, or lifts patient carefully, supporting patient's head, and places on table.

v) Makes sure patient is being attended and there is no danger patient will fall off table.

If patient has respiration, cardiac, infusion equipment or urinary catheter attached, makes sure that equipment is being monitored and is not dislodged.

vi) Checks that patient is in gown, with all jewelry removed; may check that patient is being kept warm.

vii) If not already done, may question patient or accompanying staff member about any prior preparations and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

viii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

ix) If any preparatory procedures were not carried out, if patient has sensitivity to contrast,or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

x) Answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior.

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Attempts to calm patient and gain cooperation by communicating as appropriate, to patient's age or, if appropriate, level of functioning or degree of coherence. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient to speak to physician.

xi) Notes the patient's body type, whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points will be easy to find. For adult female, may note whether breasts are large and pendulous. If so, may have staff member draw the breasts to the sides and hold in place with wide bandage.

xii) Unless measurements have already been made, performer may use centimeter calipers to measure the thickness of the chest at the level(s) and in the direction(s) in which the central ray of the x-ray beam will pass through the centered part from tube to film. Records for use in determining exposure factors. After measuring, has patient rest in as relaxed a position as possible.

b. Performer may inform attending radiologist when patient is ready to be examined. May bring requisition sheet, patient's medical history, chart, and any prior films and scans to radiologist. Displays radiographs on view boxes.

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i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

ii) Performer may accompany radiologist to examination room, greet and/or introduce patient and staff members.

c. If not already done, performer joins radiologist, patient and other staff in examination room.

d. During radiologist's review of requisition, prior radiographic materials, and examination of patient, performer notes radiologist's orders:

i) If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.

ii) If radiologist decides to proceed, notes orders for scout films depending on expected procedures. Notes patient position, projection, area of interest, centering, phase of suspended respiration. If biplane scouts are requested, notes whether alternating or simultaneous exposures are required. Performer may be asked to make a PA projection of the chest so that estimation of size of aortic root can be made and catheter selected for coronary arteriography. May be asked to make left PA oblique, right PA oblique (or left AP oblique), and left lateral projections so that technical factors and optimal positioning can be selected.

iii) May provide radiologist with hospital gown, gloves; mask. Provides leaded apron and gloves to radiologist. Provides patient and anyone who will remain in room during exposure with appropriate protective shielding. If a staff member will be asked to assist, performer provides leaded gloves and apron. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

4. Performer makes preliminary film(s) as ordered after making sure that patient is being attended. Sets up equipment for the examination before positioning and immobilizing patient:

a. Performer determines whether single or biplane serial changer (s) will be used for scout films, or appropriately positioned cassettes. Unless otherwise ordered, plans for use of lateral changer for oblique scout films.

i) If single or biplane changers will be used for PA and/or lateral projections, and/or a single lateral changer will be used for oblique projections, performer sets changer(s) for manual control so that only one scout exposure will be made for each position. Loads changer(s) with appro-

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priate cassette(s) or operates film transport(s) appropriately for scout filming. Depending on equipment, may roll horizontal changer under table.

ii) If regular cassettes will be used, selects cassette(s) of appropriate size. Plans to place cassette on table for PA projection and in vertical holder next to table for lateral and/or oblique projection(s).

b. Performer attaches appropriate identification information:

i) May place right or left marker on cassette as appropriate to the projection or depresses appropriate R or L button for automatic marking. May tape R or L marker to patient's body.

ii) May place identification information on appropriate corner of cassette; may set flashcard aside for later use with space created by piece of leaded rubber on appropriate edge of cassette; may place patient's card into card tray for equipment using automatic film marking device.

iii) Sets counter if or as appropriate.

c. Depending on whether single or biplane changer(s) are being used, performer sets the technical factors for the first or next scout film or for right-angle projections as appropriate to each machine and the exposure it will make. Performer selects the exposure factors for the preliminary scout projection(s) as described,

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taking account of the measurements taken of the patient:

i) Sets each control panel for radiography mode, and, as or if appropriate, for simultaneous or alternating exposures for biplane equipment.

ii) For each projection, selects milliamperage and chooses selectors for the correct focal size. Selects and sets the exposure time that will produce the mAs desired. Sets the kVp selected by choosing the combination of major and minor kilovoltage settings to produce the desired kVp.

iii) Depending on the equipment, may set controls to provide for manual tableside adjustment of collimator, table and x-ray tube height and position (unless these have already been set).

iv) Performer may set the focal-film distance(s) if not already done. Operates controls or manually moves the x-ray tube(s) into place. Checks each focal-film distance by reading indicator scale in the tube housing; adjusts until the required FFD is obtained.

d. Performer prepares patient for final positioning:

i) Depending on patient's age and condition, performer may obtain help in positioning and immobilizing patient. May explain to staff member what is required.

ii) With very young patient, performer may immobilize patient's arms by extending them and

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placing them along sides of head, next to the ears. May apply a sleeve made of a diaper, towel, pillowcase or orthopedic stockinet to hold arms so that sleeve holds arms above and behind head, one at each side.

iii) When positioning a patient with a balloon catheter or IV drip in place, performer makes sure that no radiopaque part is lying over an area to be exposed, or that patient is not lying on a clamp. Makes sure to avoid any actions that will separate catheter tubing from drainage bottle or dislodge IV needle. Remains alert to patient's respiration. Does not force patient into a position where any breathing difficulty increases. Does not force flexion of the neck.

e. For PA projection (anterior view) of heart and aortic arch, performer has patient assume prone position on table or assists into position:

i) Centers the mid-left chest sagittal plane or median sagittal plane of body to midline, depending on standard procedure. Adjusts film so that upper border is slightly above the shoulders, with center of film at the level of the sixth thoracic vertebra.

ii) Has infant's arms placed over head; has older patient place arms at sides. Has patient rest head on chin or left cheek in a comfortable position. Supports ankles, places soft radiolucent pad under bony prominences and head. May adjust head so that median sagittal plane is vertical. Has female patient's breasts held to the sides as described earlier. Has patient rotate and depress shoulders forward, flex elbows, and place back of hands well down on hips. Adjusts shoulders to lie on a single transverse plane with clavicles below the apices. Has patient keep shoulders in contact with cassette or table top or uses band. Makes sure that there is no rotation of thorax.

iii) Directs central ray vertically at right angles to midpoint of film, entering at sixth thoracic vertebra (at the midsternum on anterior side).

f. For horizontal beam left lateral projection of the heart and aortic arch, performer maintains patient in prone position for biplane or single plane filming, or has patient assume supine AP position on table. May have patient elevated on radiolucent pad.

i) For prone positioning for lateral projection of heart, performer maintains patient in position as described above, but has patient place arms over head (if not already done).

ii) For supine positioning for lateral projection of heart, performer has patient lie in supine position on table, centered as described above for PA position, with thorax elevated, and arms above head and supported. Adjusts head so that its median sagittal plane is vertical. May elevate knees and place restraining bands across legs.

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iii) Performer positions lateral changer or cassette in vertical holder on left side of patient. Centers so that midaxillary line of body is somewhat posterior to the midline of film, with shoulders included in film. Centers to the level of the sixth thoracic vertebra or midsternum.

iv) Directs central ray horizontally at right angles to midpoint of film.

g. For a horizontal beam left PA oblique projection (left anterior oblique view) of the heart and aortic arch, performer starts patient from supine or prone position as appropriate. Maintains lateral changer as in position for left lateral projection. May support head on pillow. Adjusts table height to center area of interest to film.

i) Rotates patient or table so that the anterior surface of the chest is towards the film, with patient lying on left side, with left side closest to the vertically placed film, and right side elevated.

ii) Adjusts rotation by elevating and supporting right side at desired angulation such as 45° to 70° as ordered. Keeps patient's spine straight and has arms raised comfortably out of the line of the central ray. Checks that shoulders are on a single transverse plane, with patient facing straight ahead.

iii) Directs central ray horizontally at right angles to film, entering center of area of interest at the level of the sixth thoracic vertebra.

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h. For a horizontal beam right PA oblique projection (right anterior oblique view) of the heart, especially left ventricle), performer maintains changer and x-ray beam alignment as for left PA oblique projection.

i) Rotates patient on table so that right side is elevated and closest to vertically placed film, with anterior aspect of patient facing film, and patient resting on left side. Has arms raised comfortably out of the line of central ray, and supports head on cushion.

ii) Adjusts rotation so that chest is at 15° to 45° as ordered. Makes sure that spine is straight and shoulders lie on a single transverse plane. Adjusts table height to center the area of interest.

iii) Directs central ray horizontally at right angles to film, entering center of area of interest at the level of the sixth thoracic vertebra.

i. If a horizontal beam left AP oblique projection of heart (left posterior oblique view) is required, maintains or positions patient in relation to table exactly as for right PA oblique projection, but reverses the position of the film and the central ray.

i) Notes that the same patient position will give equivalent RPO and LAO projections, so that cine and serial projections can be made without changing patient's position.

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ii) Notes that for a right AP oblique projection, positioning is as for left posterior oblique projection, but with film and central ray positions reversed.

j. For vertical beam frontal or oblique projections, performer centers film in changer under recumbent patient.

- i) For AP oblique projections, positions patient or tilts table from supine position. For PA oblique projections, positions patient or tilts table from prone position. Reverses for cine filming.
- ii) Elevates and supports the side opposite the side of interest so that the shoulder and chest on the side of interest are in contact with table (closest to film) at the angle indicated. Supports and immobilizes.
- iii) For AP oblique positioning may have patient pronate hands beside hips. For PA oblique position may raise patient's arms out of the way of beam.
- iv) Directs central ray vertically at right angles to film through the center of the area of interest.

k. If not yet completed, performer immobilizes patient in position.

- i) Places restraining bands, strips of gauze, and adhesive tape as needed. Avoids use of compression band across abdomen or chest. May check that there is no rotation of thorax.
- ii) After patient has been immobilized, performer makes sure that patient is still able to make small movements necessary for normal circulation, respiration and other vital functions.

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Checks final positioning using light in collimator. Activates the collimator light and points the light beam towards the part. Uses cross-hair shadows as reference for center of field, and uses the collimator light to center the tube to the part.

iii) Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube to provide better centering.

l. Once the patient has been positioned and immobilized, performer adjusts the collimator so as to expose only the area of interest as defined by radiologist.

- i) May attach an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the area of interest.
- ii) Performer may mark patient's skin to show original collimation and centering points; may record exposure factors to facilitate any further filming required.

m. If not already done, performer applies appropriate lead shielding to gonads and other sensitive areas that may be in the primary beam but are not of interest for the examination. Makes sure that anyone remaining in room is supplied with lead gloves and apron and stays out of central beam, especially horizontal beam.

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n. Performer may rehearse coherent patient in breathing out and holding or breathing in and holding, depending on orders, or observes patient's breathing and plans exposure for the appropriate quiet phase.

o. Performer makes the exposure:

  i) Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted.
  ii) Returns to control panel. Makes sure controls are properly set and patient is still in position. As rehearsed, tells patient when to breathe as rehearsed and hold breath, or observes patient's breathing and times exposure to the appropriate quiet phase required.
  iii) Performer initiates exposure by pressing hand trigger or exposure control button (or appropriate control for simultaneous or alternating biplane exposure).
  iv) While exposure is underway, performer may check that mA meter records appropriate current as set, that kVp meter dips slightly.
  v) May watch for evidence of malfunction, such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction, may decide to report; anticipates need to repeat exposure.
  vi) After exposure is completed, tells patient that he or she can relax. Returns to patient. Removes the cassette(s) and any markers for further use.

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p. If more than one single plane scout film is ordered (and if biplane equipment was not used), or if both biplane right angle and oblique scout projections are ordered, performer proceeds with additional projections as described; adjusts technical factors as appropriate.

q. Performer arranges to have the scout film(s) processed at once or decides to do personally. Attaches ID card for use with flasher if appropriate. May sign requisition.

  i) While film(s) are being processed, makes sure that patient is comfortable and attended by staff person or self.
  ii) Performer brings the processed scout film(s) directly to the radiologist in charge, places on view boxes, and/or arranges to have viewed in darkroom; informs radiologist when the radiograph(s) are ready. May place prior films for viewing as well.

5. During radiologist's review of the scout film(s) performer notes radiologist's orders:

  a. If radiologist decides to cancel or reschedule procedure, performer may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.
  b. Performer notes whether radiologist requires a change in technical factors and/or patient positioning, centering, or central ray angulation for later filming.

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i) Performer records or notes orders for later use in the examination and/or repeats preliminary radiography as ordered.

ii) Notes whether any problem with technique is due to performer's own lack of attention, malfunction of equipment, or preference of radiologist for density or contrast, and adjusts as appropriate to avoid any need for future "retakes."

c. If radiologist will proceed, notes radiologist's final orders on sequence of examination and use of contrast and equipment:

i) Notes final decisions on puncture site, whether general anesthesia will be administered, whether, if not already done, patient will require sedation, IV drip, administration of vasodilator, preparation of puncture site. Notes appropriate timing and whether the performer will assist.

ii) Notes final decision on sequence of events, such as nonselective coronary arteriography, left ventriculography, left coronary arteriography, right coronary arteriography.

iii) Notes final orders on catheter sizes,types and shapes, puncture needles, guide wires, type and amount of contrast solution. Notes whether pressure injection will be used for nonselective coronary arteriography, left ventriculography.

iv) Notes whether single or biplane cineradiography will be used, single or biplane serial changer(s), vertical cine with horizontal beam serial changer, use of videotape.

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v) Notes final orders for rate and frame settings for cine. Notes programs for serial film changers for each area of interest or stage of the examination. Notes number of exposures, per-second intervals for each patient position and injection, the number of series anticipated. With biplane equipment notes whether simultaneous or alternating exposures are required.

vi) If computer program(s) are to be used for serial filming (giving the number of films to be taken, per second intervals, number of separate series, and possibly a program to coordinate with automatic pressure injection), performer arranges to have keypunch control card(s) prepared,or delivered and checked, or decides to do personally. When control cards are ready, performer places as appropriate in control panel of computer.

vii) May note whether injector and/or cine equipment is to be coupled to multichannel ECG monitor. May note appropriate point in cardiac cycle that injector is to be activated.

viii) If not already done, performer discusses the sequence and timing of the procedure and what performer will be responsible for. May arrange signals for operation of fluoroscopic controls, signals for initiation of serial filming.

6. Performer carries out preparations for angiography as ordered by radiologist based on the part of the work for which performer will be

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responsible. May carry out any or all of the following:

a. If performer is responsible for procedure tray, arranges to replace or provide any equipment or materials ordered by radiologist not already on tray. May assist in preparation of catheters, puncture needle, syringes containing saline solution, local anesthetic, anticoagulant, contrast solution, vasodilator. Notes or checks amounts ordered. Checks contrast for signs of chemical deterioration.

b. If performer will be responsible for filming, prepares ahead for fluoroscopy, cineradiography, videotaping, serial filming and automatic and/or manual injection:

   i) May reset technical factors for fluoroscopy, cine and/or serial filming based on radiologist's review of scout film(s) and the presence of contrast. If required, changes or adjusts program settings for cine.

   ii) Sets programs for serial film changer(s), automatic injector as appropriate. Checks that planned exposure time does not exceed available capacity of unit. If not already done and computer program will be used, checks keypunch control card and places in computer control panel.

   iii) Performer may load cassette changer(s) with proper number of vacuum or other type of cassettes as ordered. (If appropriate, loads cut film changer or roll film changer.) If the same cassette changer will be used for lateral and AP projections, loads only enough cassettes for series in the first

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projection so as to avoid artifact caused by shadow from last exposure in one position on the first cassette to be used in next position. If biplane changers are to be used, loads changers as appropriate for simultaneous or alternating exposures.

   iv) If appropriate and not already done, positions equipment for the combination of cine, videotaping and serial filming for first series. May position biplane cine equipment for PA and lateral projections with patient supine; biplane serial changers and x-ray tubes for lateral and/or vertical beam projections; cine for single plane vertical filming, and serial changer for single plane horizontal filming, as appropriate for series to be taken with first (or next) injection. Moves any equipment out of way that must be positioned after fluoroscopic check of catheter placement.

   v) For computer controlled units, plugs synchronization cable from control unit into appropriate receptacle on the x-ray control panel.

   vi) Performer may set up equipment for automatic marking of films in numerical sequence or records cassette numbers for the sequence.

   vii) If automatic pressure injection is to be used, may attach tubing to syringe containing the contrast solution using sterile technique. Attaches to machine and mounts syringe as appropriate. Checks that there are no air bubbles and that machine is on "stand-by." If appropriate, plugs in synchronization cable from (or to) ECG monitor.

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If automatic injection is not computer controlled, sets flowrate dial for the cc's per second ordered by radiologist. When ordered by radiologist, sets pressure control as designated.

viii) May plug in cable from or to ECG monitor so that electrocardiogram will be filmed during cine filming.

c. If performer is to assist with preparation of patient for catheterization, washes hands observing sterile technique when appropriate.

- i) If not already done, may arrange to have puncture site and locations where ECG leads will be applied shaved and prepared. Has patient lie in supine position.
- ii) For femoral artery puncture, abducts patient's legs and exposes the femoral artery on the side to be punctured below the inguinal ligament, as high as possible, but allowing for later compression proximal to puncture site.
- iii) Immobilizes patient as appropriate. May adjust shoulder supports; may use wrist restraints.
- iv) May swab puncture site area with antiseptic solution and cover surrounding area with sterile towels.
- v) If appropriate, may make sure that ECG monitoring leads have been applied, or decides to do personally. Notes which staff member(s) are assigned to monitor ECG, blood pressure, other vital signs.

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d. Informs radiologist when patient and materials are ready.

e. If not already done, provides radiologist with lead shielding, gloves, sterile gown, gloves, mask. Makes sure that patient and everyone to remain in room is properly shielded; may place lead screen in place if radiologist will inject contrast by hand.

f. If patient is to have general anesthesia, performer awaits signal that procedure can begin.

g. May receive or obtain a clean hospital gown, cotton "boots," cap and mask. Dons these before approaching sterile area. Carries out appropriate steps to maintain the integrity of sterile areas. Avoids touching patient, drapes, radiologist, nurse or instrument table with non-sterile object.

h. During injection of local anesthetic, puncture, placement of needle and advancing of catheter, performer assists as appropriate.

- i) May hand materials and supplies asked for using sterile technique.
- ii) May assist with fluoroscopic viewing of needle and progress of catheter placement. On signal from radiologist, performer may dim room lights; turns on TV power switch. May operate fluoroscope controls on orders from radiologist. Adjusts kVp and/or mA controls according to radiologist's orders. Continues as ordered.
- iii) Performer may operate tilt table on orders from radiologist; may assist in positioning patient as ordered. Continues as ordered.

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- iv) May assist with attachment of syringes to flush catheter, inject vasodilator and/or inject contrast solution for fluoroscopic check of catheter placement. Repeats as appropriate while radiologist continues, replaces dilator catheter with injection catheter,or punctures alternative site.
- v) Once catheter position is judged satisfactory, performer may tape into position.
- vi) May assist with attachment of manometer or stopcock and transducer for multichannel monitoring of blood pressure at catheter tip.
- vii) Notes final orders on sequence to follow, collimation, centering, program or positioning. Makes any last minute changes as appropriate.

7. For nonselective coronary arteriography, performer may proceed as follows:

   a. Positions table, cine and video equipment and/or serial changers and x-ray tubes for first injection as ordered and as described.

      - i) If not already done, and if automatic injection will be used, sets the rate and pressure setting as ordered.
      - ii) If not already done, plugs in all synchronization cables or checks that this has been done.

   b. Performer assists in positioning patient as ordered and as appropriate. Centers film changer(s) and/or assists radiologist in centering fluoroscopic image intensifier.

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   c. Checks that serial changer(s) and/or cine camera and videotape device are loaded, locked and ready. Collimates to smallest possible exposure area as ordered. Checks patient's and staff shielding.

   d. If first (or next) injection will be coordinated with serial film changer(s), and,depending on whether injection is by hand or automatic, manually initiated or computer controlled, performer starts the automatic film changer(s) on signal of the radiologist, or initiates the computer control of the injection and serial exposures at the control panel.

   e. With cineradiography and videotaping, performer may operate tilt table or fluoroscopic controls as ordered, as described above.

   f. Performer continues with any additional injections and filming ordered before processing and review, such as right angle or oblique projections using serial and/or cine and videotape.

      - i) Resets technical factors as appropriate.
      - ii) Positions, centers, collimates, and shields as described.
      - iii) If one single-plane changer is being used,reloads changer with cassettes or adjusts roll or cut film transport for additional serial projections. Sets up as described earlier.
      - iv) Repeats coordination of filming with injection as described.

   g. Performer has the serial and cine films processed at once:

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- i) Makes sure that serial films are numbered for appropriate order in sequence.
- ii) With cine, checks that cine camera is turned off and that the film transport mechanism has come to a complete stop. Unlocks and removes film magazine.
- iii) May sign or have radiologist sign requisition sheet.
- iv) Performer arranges to have serial and cine films processed at once personally.
- v) Performer may operate the replay mechanism of videotape attachment if so ordered. May "freeze" a given image on screen when ordered.
- vi) When the serial films have been processed and returned, performer places on view boxes. May also hang scout(s) and prior films.
- vii) May give processed cine film to radiologist and set up cine projector and screen.
- viii) Informs radiologist when radiograph(s) are ready for viewing.

h. Notes radiologist's orders on how to proceed:

- i) Performer notes whether radiologist will inject additional contrast, repeat injection and filming with change in technical factors, program and/or views projected.
- ii) Performer notes whether radiologist will proceed with left ventriculography, left and/or right selective coronary arteriography.
- iii) Carries out repeat of nonselective coronary arteriography as appropriate after adjusting pressure, technical factors, patient's position, or centering as ordered.

8. For left ventriculography, performer may proceed as follows:

- a. Performer assists with fluoroscopic control of catheter placement and check of position.
- b. Positions patient and equipment for frontal and lateral, single or biplane cine and videotape, cine and/or serial projections as ordered. May position as described so that a right anterior oblique projection or view can be made with cine and/or serial equipment appropriately placed.
- c. Sets up for automatic injection of contrast as described.
- d. Coordinates serial filming with injection and/or assists with cine and videotaping.
- e. If appropriate, assists with periodic pressure reading. Is alert to need to assist with provision of any emergency care.
- f. Arranges to have films processed and displayed as described.
- g. Repeats as appropriate for additional injections, positions and projections.
- h. Notes whether radiologist will proceed with selective left and/or right coronary arteriography.

9. For selective left coronary arteriography, performer may proceed as follows:

- a. Assists with fluoroscopy as described while radiologist replaces prior catheter with left coronary catheter.
  - i) May assist radiologist to fill radiolucent catheter with contrast to assist with viewing.

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ii) Assists with rotation of table, fluoroscopic controls as ordered, as described.

b. Performer sets up for hand injection, single plane serial and/or cine and videotape filming of patient as ordered, such as left posterior oblique, left lateral, right posterior oblique projections. Positions table or patient as described earlier, depending on whether cine and/or serial filming will be done.

c. Repeats appropriate steps for collimation, shielding, setting technical factors and programs as described, according to radiologist's orders.

d. Coordinates exposure with hand injection(s) of contrast as appropriate. Assists with tilt table as ordered.

e. Repeats processing and review as described. Repeats any steps as appropriate.

f. Notes whether radiologist will proceed with selective right coronary arteriography.

10. For selective right coronary arteriography, performer may proceed as follows:

a. Assists with table and fluoroscopy while radiologist replaces catheter with one shaped for right coronary artery, positions catheter, fills with contrast, and places for injection.

b. Carries out appropriate steps similar to those for right coronary arteriography. Positions table or patient for right and left posterior oblique and left lateral projections and/or as ordered. Sets technical factors, serial program, centers, collimates, provides shielding as appropriate.

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c. Coordinates exposures with hand injections by radiologist as described. Arranges for processing and review as described.

d. Continues, repeats as ordered.

11. Throughout procedure performer remains alert for any symptom of emergency or adverse reaction to contrast. As soon as performer judges that there is a reaction, performer notifies radiologist. May assist as appropriate with emergency care.

12. When informed by the radiologist that the radiographic examination is completed, performer may assist with termination steps. May carry out any or all of the following as appropriate:

a. May assist while radiologist removes connecting tubes, syringes, and catheter. Removes any markers from patient's body.

b. May prepare to apply pressure to arterial puncture site when ordered. May prepare to apply pressure dressing to puncture site after manual pressure has been applied.

c. Performer coordinates with anesthesiologist if present and/or other staff members responsible for recovery and after-care of patient. Makes sure that patient is attended and will be transported to appropriate next location such as recovery area or room.

d. May present requisition form to radiologist for comments and signature. May supply form if radiologist orders additional examination and/or delayed films or tests.

e. Performer records the examination according to institutional proce-

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dures. May include date, room, examination type, the serial views taken, the technical factors used, and film sizes. May record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. Signs requisition sheet. f. Performer may record the fluoroscopic and cine exposure including exposure time and rad dosage from posted data. g. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements. Makes sure that any nondisposable guide wires and catheters are cleaned and flushed immediately after use and before sterilization. h. Performer may remove synchronization cables connecting ECG multichannel machine with pressure injector and/or cine equipment. May return accessories such as computer control cards and immobilization devices to appropriate locations or has this done. i. Performer may decide to jacket radiographs, requisition sheets and related materials, and/or have information recorded in log book personally, or have this done, depending on institutional procedures. j. May indicate to appropriate staff person when the performer is ready to proceed with next examination.	

TASK DESCRIPTION SHEET

Task Code No. 526

This is page 1 of 18 for this task.

1. **What is the output of this task?** (Be sure this is broad enough to be repeatable.)

Requisition reviewed;C.T.T. equipment set up for scan;pt. reassured,positioned,immobilized;scan(s) run;line-print out(s) made;scan(s) viewed as display; controls adjusted;scan displays photographed;scans recorded on magnetic tape;scans presented for review by radiologist;radiologist assisted with contrast IV injection or infusion;postinjection scans made,presented for review,recorded as ordered;pt. returned; examination recorded;C.T.T. scans placed for use.

2. **What is used in performing this task?** (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet,ID card,ID bracelet, medical-technical history;sterile tray with materials for IV injection or infusion of iodine based contrast solution;tourniquet;arm board;emergency cart;clock; immobilization devices;C.T.T. scanning units,generators,control panels,computer,teletype;line printer, paper;camera and film;program and data discs and/or magnetic tape cassettes or reels;examination table or couch;operator's manual;display unit(s) and controls; absorption coefficient charts;collimators;stool;forms; shielding;intercom;stretcher;wheelchair;adhesive;emesis basin,towels;log book;hospital gown,gloves;marking pen;centimeter scale;scissors;pen;write enabl[illegible] ring;cleaning materials

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. **If "Yes" to q. 3:** Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant conditions; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any pt.;accompanying adult;radiologist;anesthesiologist;co-worker;nurse

5. **Name the task** so that the answers to questions 1-4 are reflected. Underline essential words.

Taking computerized transverse axial tomographic (C.T.T.) scans of any pt.,by reviewing request;preparing equipment;setting technical factors,scan level;reassuring,preparing,positioning,immobilizing pt.; providing shielding;running scans as ordered using appropriate controls;viewing scans;adjusting viewer controls;making line print-outs,photographs of scan displays as ordered;recording scans on magnetic tape; presenting scans for review by radiologist;assisting with IV injection of contrast;continuing,repeating scans,recording,reviewing as ordered;having pt. returned;placing C.T.T. scans for use;recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a patient scheduled for computerized transverse axial tomography (C.T.T.) of the brain or other part of the body (cross section radiographic scans at various levels of the skull or body,reflecting differential radioabsorption of various types of normal and abnormal tissue and other substances) as a result of:

a. Regular assignment.
b. Checking assignment on schedule sheet.
c. Having arranged requisitions in order of priority.
d. Receiving from co-worker.

C.T.T. equipment may include E.M.I. or A.C.T.A. scanner, or any similar type, depending on institution; may be referred to as C.T.T., C.T., or C.A.T. scanner.

1. Performer reads the requisition sheet to determine the examination called for, the patient involved,any special considerations, to plan for the procedure, and to check the completeness of the information provided:

   a. Performer checks the part of the skull or body to be examined. Notes whether a routine screening study is involved (with standard orders for number of scans,

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

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levels, angulation, and preparation of print-out, tape, and photographic records before radiologist is involved), or whether radiologist will examine patient, view scan data on cathode ray tube display, and decide on further steps such as intravenous injection or infusion of contrast medium.

b. Notes the name of the radiologist in charge; may note the name of the referring clinician.

c. Performer reads patient's name, identification number, sex, age, weight, and height. Notes whether patient is in-patient, out-patient or emergency patient.

d. Performer notes standard or special orders for examination, depending on the options available with the equipment to be used:

  i) Notes the number of scans to be made, the cm. distances from an anatomical reference plane to the level of the scan.
  ii) Notes the angle of the scan (cut) in degrees from an anatomical reference direction.
  iii) May note whether a long or short scan will be used, depending on the part of the body involved and condition of patient. Notes the number of degrees between successive scan passes if an option.
  iv) May note the kV or mA recommended (if variable).
  v) May note the collimated beam width recommended (if variable).
  vi) May note which records to make before viewing by radiologist, such as line print-out, photographs of displays, putting permanent record on magnetic tape. Notes any orders on use of viewing options to use for photographs.

List Elements Fully

e. Performer notes relevant information about the patient's history and orders for prior preparations:

  i) If contrast may be used, notes whether patient has prior history of allergic reaction to contrast or history of allergies. Notes whether allergy test has been ordered and, if so, results.
  ii) Depending on institutional procedures and the area to be examined, notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus.
  iii) Notes whether general anesthesia has been suggested. If so, makes sure that type ordered is compatible with equipment; i.e., no explosive gas or compound.
  iv) Notes how patient will arrive for examination (whether in wheelchair, on stretcher, accompanied by staff member, whether patient will be coherent, sedated).
  v) Notes any special information that will affect patient positioning, immobilization, or handling, such as presence of accident injuries, unhealed or suspected fracture, behavioral disorder, incoherence, tremors, heart disease, communicable or infectious condition.
  vi) Performer notes whether there are orders on prior preparation of patient such as allergy test, lab tests, prior administration of sedation, tranquilizer, antihistamine, analgesic, other medication. Notes appropriate timing for medications to take effect.

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Checks whether all prior procedures have been carried out and at appropriate time, and that all reports ordered are with patient's chart. If there is any problem, arranges to have prior procedures carried out, examination postponed to allow proper timing, reports problem to appropriate staff member, or plans to inform radiologist.

vii) May check that no contrast study has been done in the recent past which would leave a residue of radiopaque contrast, or gas in the ventricles, subarachnoid spaces or body cavities in the plane(s) of interest which would interfere with the accuracy of the density readings.

viii) May check that there is no danger of artifacts from implanted dense substances,such as clips resulting from surgical or therapeutic procedures,or prosthetic devices such as hearing aid. May plan the angle of the scan to avoid these or note angle ordered to avoid these.

f. Performer considers the patient immobilization and shielding needed for the scanning based on patient's age, sex, the scan levels ordered, patient's condition, and the equipment involved. Considers shielding needed for self and/or anyone to remain in the room during scanning.

g. If the referring physician has requested that prior films, ultrasonograms, prior scans and/or test results already on file be sent with the C.T.T. scans ordered, and if not already with patient's jacketed material, performer arranges to have these delivered.

h. If the performer determines that the request is not properly authorized, is incomplete, that sufficient information is lacking for performer to proceed properly, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.

List Elements Fully

2. When performer is clear about what will be involved in examination, he or she goes to appropriate room for the equipment required, or notes room assigned on requisition sheet. Prepares ahead so as not to keep patient in examination room longer than necessary. Washes hands as appropriate. Makes sure that no unauthorized person is in examination room.

a. If contrast may be administered, performer checks that procedure tray has been prepared with materials for injection or infusion of contrast. Checks that appropriate aqueous iodine based contrast solution is present. Checks that there is no evidence of chemical deterioration. May check that contrast solution is at appropriate temperature; may arrange to heat or cool. Makes sure that emergency cart is present. Checks for emesis basin, towels, availability of cold water.

b. Checks that proper accessories are available for procedure including appropriate shielding to be used by performer, the patient, and/or anyone who will remain in the room during exposure. Checks that appropriate immobilization devices are present, special cradle or restraints for pediatric patient, pads, pillows and/or blankets.

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c. To prepare for scan, performer makes sure that the C.T.T. equipment is warmed up and ready for use, and that controls are unlocked. Sets controls as appropriate to equipment if not already done:

- i) Makes sure that system has been warmed up. May check that ready light is on, or switches on standby control and makes sure that standby light comes on. May check that machine is not set at position to calibrate density factors.
- ii) Checks that x-ray voltage generator is on and running at nominal output, that viewer and computer are on and ready.
- iii) If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.
- iv) Checks paper supply in teletype and, if appropriate,separate line printer. May check whether printing is faint and whether carbon ribbon needs changing. If appropriate, obtains additional paper and/or carbon ribbon. Loads as appropriate to equipment; advances paper or ribbon and checks that unit is operative.
- v) Makes sure teletype unit or other data terminal controlling the computer is on line and power is on.
- vi) If equipment may provide line print-out of scan as soon as scan is completed,and print-out is requested,makes sure printer is on and set to print as appropriate.
- vii) If scan is to be recorded on magnetic tape automatically, may set appropriate switch.
- viii) If the C.T.T. scanner involved has a water filled head box for

List Elements Fully

brain scanning,performer checks that head box is filled with enough water so that there is no air in the x-ray beam path. Checks that water heater is off and that water is at appropriate temperature. May clean external surfaces of head box through which beam passes.
- ix) Checks that scanning area is clear and that unit is in start position. If appropriate, operates controls to return scanning unit carriage and rotation assembly (gantry) to start position. Makes sure that examination table or couch is properly attached to scanning unit.

d. Depending on equipment, performer may check that a proper system program magnetic disc and/or magnetic tape is inserted in appropriate unit to record the scan data.

e. If a tape is to be mounted to receive scan data, performer may proceed as follows:

- i) Places empty takeup reel in position on tape unit. Obtains and places tape to be used into position and threads as appropriate so that tape will be wound on takeup reel. Sets appropriate switch.
- ii) If the tape already has data recorded on it, performer uses teletype to enter code that will set the tape at end of the last record (scan).
- iii) If the tape is new, performer uses teletype to enter code that will allow recording of tape label.
  When teletype calls for new tape number, performer executes appropriate steps with teletype to enter a tape identification number (chosen as appropriate

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according to institutional procedures),the date, and/or any other information for use on the tape label.

iv) Performer positions the tape to record on appropriate portion of the reel by typing appropriate code. Checks that teletype message indicates that computer is ready for input data, such as "Scan Code?" and sounds beep or "Program Number?"

f. If a magnetic disc is to be mounted to receive data, performer may proceed as follows:

i) Checks for proper disc type and serial number. Places disc into disc drive unit. Checks that machine switches and settings are set to run, that ready light is on, and that computer is set to receive input data.

ii) If the disc has already been used, and performer wishes to erase disc, types appropriate code and setting for erase, and responds to teletype as appropriate to erase disc, enter the disc identification number, hospital name, or enter current or new crystal factors (for equipment or programs requiring that crystal factors be entered in the program on each disc)or zeroes.

iii) Carries out appropriate steps for new disc by entering identification information and crystal factors if or as appropriate.

iv) Enters data as appropriate.

v) Checks that teletype message indicates that equipment is ready to receive input data, such as "Program Number?"

g. If, in preparing for the scan procedure, the teletype does not indicate that the computer is ready

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to receive input data with message such as "Program Number?" or "Scan Code?" and beep sound, performer may reset or reload the program(s) in the computer's memory as appropriate to equipment. May do any or all of the following:

i) If the system programs are permanently on each data disc and protected from erasure, performer loads the system program automatically when the disc is loaded into the disc drive unit, as described.

ii) If the teletype does not print appropriate message, performer may check teletype, computer settings, and switches as appropriate; may reset program by setting switches to initiate a self examination check, and then reset and restart, following appropriate steps for switches and controls.

iii) If the program must be reloaded using system programs on separate disc or cassette or program tape, performer inserts program disc, cassette or tape reel in proper place in disc or tape drive unit. May rewind tape as appropriate.

iv) If appropriate, performer may erase irrelevant information from computer's memory (initialize) to prepare for loading of system programs. Enters appropriate code on teletype. Sets switches as appropriate; sets to enter, load and run. Checks that appropriate light comes on.

v) If appropriate, sets controls to load system loader and/or program(s). Checks or sets ap-

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propriate switches. Checks that cassette is rewound and ready. Sets to load and run.

vi) Performer has program read in by setting appropriate switches and activating. Notes appropriate operating signals. When the program has been read in as indicated by light or teletype message, performer may check that the contents of the display registers show as appropriate.

vii) If appropriate, rewinds program tape or cassette using proper controls. Removes and stores tape or cassette.

viii) If performer has initialized the computer memory, if it is the start of the day, or if a new tape or disc has been loaded, performer may use teletype to read the date into memory for display with scans; may type in date in appropriate digital month-day-and-year format; may check date by having it displayed, as appropriate.

ix) Checks that computer is ready by activating as appropriate, such as with start or standby switch. Checks that teletype message asks for input data such as "Scan Code?" and beep sound or "Program Number?"

h. If not already done, performer checks whether camera unit is loaded with adequate film for the procedure. May check film supply indicator or opens back of camera and inspects.

i) If camera uses Polaroid film cassette containing film for eight exposures, notes number of unexposed films remaining

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and provides additional package(s) from storage area. Reloads when appropriate.

ii) If loading Polaroid film package, performer opens camera and package containing film. Handles carefully and removes film pack from bag. Discards any moisture absorbing paper and inserts film pack in camera as appropriate in relation to light shield and restraining spring. Checks position of tabs. Closes camera. Checks and removes safety cover by pulling out by tab. Rechecks and readjusts if needed.

iii) If camera uses roll film and there is insufficient supply in camera, performer arranges to have roll film cassette loaded, or decides to do personally. When loaded roll film cassette is obtained, checks loading in subdued light. May check that end of film is cut correctly and is properly threaded and attached to takeup spool so that film unwinds appropriately. Checks that film is properly engaged in sprockets. Locks into operating position. If appropriate, cuts off excess film at exit port and removes. Attaches film cassette to camera and locks into place. Replaces camera cover. If there is an adequate film supply, checks that film is properly loaded. Advances film to compensate for any exposure of film due to installation or check. Removes dark slide from camera lens if appropriate.

i. Once the equipment has been checked and the computer is ready, per-

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former arranges to enter identification information for the patient's scans. May set controls to scan position.

i) If not already done, uses teletype to answer data requests such as "Program Number?" or "Scan Code?" Answers with appropriate code to call scanning program or subroutine and bring computer to a "ready" condition.
ii) May enter the code for the number of degrees between successive scan passes if an option; may select long or short scan if an option, based on requisition or standards set for the part of the body involved, or patient's size or condition.
iii) If not already done and new tape or disc is being used, enters appropriate hospital name, disc or tape name or number, and date as appropriate.
iv) Enters patient's identification number as appropriate using manual selectors or teletype as appropriate to machine. Assigns a scan number and enters as appropriate. If entered with teletype, performer mentally notes that subsequent scans for the patient will automatically be given incremental code numbers.
v) If appropriate, performer enters additional information such as body part, whether contrast was administered, special patient position used, or special collimation.
vi) If the distance from the anatomical reference plane to the level of the scan is computer controlled, performer enters specified distance as appropriate. For manual adjustment waits until patient is being positioned.

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vii) If the scanning angle is variable, for uses such as areas near the base of the skull or to overcome patient movement or artifacts, performer sets control, or types in prescribed angle as appropriate.
viii) Performer uses appropriate procedures to check identification information entered against requisition sheet; corrects errors as appropriate.

j. Performer sets or adjusts technical factors as appropriate:

i) Checks and adjusts high voltage if needed.
ii) If the x-ray beam width is adjustable by the addition or removal of collimators, performer checks requisition to note beam width prescribed. If appropriate, removes or inserts the collimators from or into their respective housings.
iii) Performer may check that meters indicating signal levels for photomultipliers are reading in correct range. If there has been an alteration in x-ray tube output or collimation has been changed, performer may have equipment readjusted or decides to do personally.
iv) If not already done, sets the milliamperage and kilovoltage as appropriate for the scan using appropriate controls. Checks meters and adjusts using controls as appropriate.
v) If appropriate for equipment, when the technical factors are correctly set, performer switches off x-rays until ready to run scan of patient.

k. If performer decides that any of the equipment is not functioning

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properly, or is not ready for use, informs appropriate staff member and proceeds as ordered or decides to carry out tests or notify service organization.

3. Depending on institutional procedures, performer may bring requisition sheet and patient's chart to radiologist, or may bring or escort patient and any accompanying staff to examination room to prepare patient for radiologist's examination or to proceed with routine scan procedure.

   a. If performer is to prepare patient in examination room, may proceed as follows:

      i) Performer washes hands as appropriate. Depending on patient's age or condition, may carry out isolation or decontamination techniques. May don gown, mask, gloves.

      ii) Performer has the patient brought from the holding area and prepared for the examination (if not already done), or decides to do personally. Depending on institutional arrangements, performer may decide to assist in bringing patient to examination room on stretcher if patient is very ill, injured, or has already been sedated, or is in wheelchair.

      iii) Performer greets coherent patient and any accompanying staff person and/or parent or guardian and introduces self. Checks patient's identity against the requisition sheet. With in-patient checks hospital identification bracelet or other identifier. Checks with any accompanying staff member on any special precautions necessary during procedure.

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      iv) Performer has patient assisted to examination table or couch or decides to do personally with help, depending on whether patient is to be positioned before being examined by radiologist. Makes sure that no equipment is in the way that may be collided with by patient.
      If patient is in wheelchair, moves patient in chair into position next to table or couch. Locks wheelchair and obtains help in lifting patient from wheelchair to table or couch.
      If patient is on stretcher, places stretcher into position and locks so that patient can be lifted from wheeled base to table or couch.
      May have nurse carefully lift infant and then place on table, or lifts infant carefully, supporting infant's head, and places in position with head supported.

      v) Depending on the part of the body to be scanned, performer may check that dense objects and clothing are removed from area of interest. For brain scan, checks that dentures, hair pins, spectacles, and any jewelry at head and neck have been removed. Makes sure that all garments are removed down to below the neck. If not already done, has infant patient's clothing removed and has patient put in gown.
      Makes sure patient is being attended and there is no danger patient will fall off table or couch. If patient has respiration, cardiac, or infusion

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equipment, or urinary catheter attached makes sure that equipment is being monitored and is not dislodged. Checks there is no danger equipment will be struck by any moving portion of the scanning unit. May check that patient is being kept warm. May support bony prominences to provide comfort.

vi) If not already done, and if contrast may be ordered, questions patient or accompanying adult or staff member about any prior preparations ordered and about any allergies, especially to shellfish, or adverse reactions to contrast medium (especially iodine based).

vii) If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy.

viii) If any preparatory procedures were not carried out, if patient has sensitivity to contrast, or if there is any possibility that patient is pregnant, and these have not already been recorded, performer informs radiologist in charge at once; proceeds only with approval.

ix) If not already done, performer explains what will be involved in the procedure and how the equipment will function. Explains the probable time intervals between scanning periods and that patient will not be left and forgotten. Explains what cooperation will be asked of patient. Indicates how long patient must remain motionless during scanning. Indicates what types of positions the patient will be asked to assume. May have patient practice holding still.

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x) Performer answers patient's or parent's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Attempts to calm patient and gain cooperation by communicating as appropriate to patient's age or, if appropriate, level of functioning or degree of coherence. Is as calm and gentle as possible. Performer explains, when asked medical questions, that it is not appropriate for technologist to answer these; encourages patient or parent to speak to physician.

xi) If patient is difficult to calm, may have parent who is present leave; may have parent recalled to help calm patient. May have staff member assist. If patient continues to be unmanageable, performer may consider requesting that procedure be delayed until child is more quiet. May discuss possibility of sedation or additional sedation with radiologist. If ordered, arranges to have administered and allows time for results.

xii) Performer provides patient (if appropriate) and anyone who will remain in room during exposure with appropriate protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.

b. Performer may inform attending radiologist when patient is ready to be examined. May bring requi-

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sition sheet and patient's medical history and chart to radiologist.

i) If not already done, performer tells radiologist about any difficulties encountered with regard to information, possible contraindications, or anything else that should be brought to radiologist's attention. Notes any special orders or change in procedure decided by radiologist. Proceeds as ordered.

ii) Performer may accompany radiologist to examination room, greet and/or introduce patient.

iii) During radiologist's review of requisition and examination of patient, performer notes radiologist's orders. If radiologist decides to cancel or reschedule procedure, may arrange to terminate and reschedule as appropriate; has any orders for rescheduling filled out and signed as appropriate.

iv) If radiologist decides that additional preparatory steps, sedation or anesthesia are needed, performer may arrange to have these carried out and/or performer arranges to reschedule patient; checks that anesthesia is appropriate for use near equipment (non-explosive).

v) Performer notes radiologist's final decisions on how to proceed. If appropriate, changes settings for length of scan,technical factors, or notes any special orders on positioning of patient, angulation, or level of scan.

vi) Notes final orders on number of scans to make before review of scan by radiologist;notes type of record to make, such as photographs of displays, line print-

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out; notes display options chosen, whether radiologist wishes to see each scan displayed as processed.

4. Performer positions patient for the first scan as appropriate to equipment and the area of interest:

   a. May have infant immobilized with extremities at sides by mummying (wrapping), or decides to do personally.

      i) If performer asks co-worker or nurse to wrap patient, indicates at what level sheet should be wrapped.
      ii) May explain or demonstrate to staff member what is required for immobilizing the patient.
      iii) May place pediatric patient in special cradle to prevent child from sliding.

   b. If patient is to have general anesthesia, performer awaits signal that procedure can begin. Proceeds, following sterile technique, to maintain the integrity of sterile areas; avoids touching patient, drapes, attending staff or instrument table with nonsterile objects.

   c. If not already done, assists patient to lie on the examination table or couch in a comfortable, supine position. Explains what is happening.

      i) May align the median sagittal plane of the body and head to midline.
      ii) May apply straps to hold or immobilize patient. May provide cushions or supports as needed.

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d. Performer may use centimeter scales attached to scan unit and reference lines, flexion or extension of patient's head, and/or tilt of table to obtain proper level and angulation for the scan "cut," and/or performer may prepare patient for proper placement:

i) For brain scan, performer may mark or define the orbitomeatal line for reference as that connecting the external auditory meatus and the outer canthus of the patient's eye. Performer may mark or define the infraorbitomeatal line (Reid's base line) as that connecting the external auditory meatus and the infraorbital margin.

ii) For areas of the body other than the skull, performer may refer to topographic anatomical reference lines and mark or define these for correct positioning.

iii) Performer may mark reference lines on patient's skin; may prepare adhesive tape so that reference lines may be drawn on the tape. For brain scan, may construct a headband such that adhesive adheres only to skin in front of ears, and rest of tape is covered by another piece to avoid having tape adhere to patient's hair. May apply a stockinet to patient's head to compress hair against skull.

iv) May mark the distances above and below reference line to show alignment for various cuts. Measures distances at right angles to reference line.

e. With a whole body scanner, positions table or scanning unit so that the body part to be examined is in the center of the scanning ring:

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i) Uses manual or motor controls to position table or couch at the appropriate level, height, and angle in relation to the scanning unit.

ii) Centers for the desired cut by viewing through an alignment slit or other device and adjusting the table to the appropriate forward or backward position, level, and tilt.

iii) May use head holder and crank to raise or lower head. Adjusts so that distance from anatomical reference line is appropriate for level of first cut, and so that angulation is correct as ordered.

f. With a water box brain scanner, performer operates controls to empty sufficient water from box to allow placement of patient's head within headbag (held in place by head cone inside box).

i) Makes sure patient is firmly positioned on couch with seat strap, or in cradle on table, so that water pressure will not force head out of box.

ii) Moves couch until head is inserted to proper depth. Aligns markings on patient's head with scale attached to unit, so that scan level is proper distance from reference line. Adjusts flexion or extension of patient's head so that reference line is at right angles to scale or at the angle ordered.

iii) Operates controls so that water enters box, allowing headbag to collapse onto patient's head and closely fit head contours. Rechecks and adjusts patient's position.

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iv) Adjusts so that patient's forehead is in contact with top of head cone and neck firmly against bottom of head box opening. May use seat strap to maintain position.

g. May further immobilize patient. Supports appropriate parts of body so that patient is comfortable and held securely, and so that patient can most easily hold still for the period of the scan. May use chin straps, gauze, pillows, restraining bands.

5. Performer operates scanner controls from shielded control area:

   a. Makes sure patient is properly positioned and everyone is out of scanning area or properly shielded. Checks that external doors are locked and any warning signal is on.
   b. Checks that all controls and interlocks are properly set for scanning and that high voltage supply is running at nominal level.
   c. Uses intercom or calls to patient to remain motionless until told to relax.
   d. Initiates scan by pressing appropriate control button.
   e. Keeps patient and equipment control panels in view during scan passes so as to respond to any emergency.
   f. During scan, may note whether proper sound for scan is occurring such as buzzer, or whether proper indicator light is on. May note whether kV and mA meters are reading in proper voltage ranges and/or fall towards zero at end of each transverse. May note whether indicator shows that there is excess of air around patient's head.
   g. Performer may encourage patient to remain motionless during scan.

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After scan, tells patient that he or she can relax.

   h. If performer decides that too much air or patient motion has occurred, or if there is some other reason to interrupt scan, performer uses controls to abort the scan. Returns unit to start position. Readjusts and recommences as appropriate.
   i. If scanning sequence does not start or is aborted, checks that x-rays are shut off. May start again as described. If there is still a problem, removes patient from unit. Notifies appropriate staff member and/or decides to carry out tests or call service organization, or have this done.
   j. If line printer is available to print out relative tissue densities, and machine has been set for this, performer may tear off print-out of scan and set aside for radiologist's review. Checks that identification information is present and correct on print-out.

6. If performer is to make record(s) of the scan before proceeding with further scanning, performer may proceed as described below:

   a. If performer is to make record(s) in conjunction with radiologist, performer informs radiologist that first (or next) scan is ready to be viewed. Proceeds as described below.
   b. If performer is to make record(s) before review by radiologist according to routine orders for the area of interest, or orders on requisition sheet, reviews what is involved and proceeds as described below.
   c. If performer is to make record(s) before review by radiologist by using own judgment and following

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general guidelines, may proceed as described below.

d. Performer checks that the scan just processed is on display or that teletype or light indicator shows that scan is ready to be viewed:

   i) If not already done, turns on viewing unit power.
   ii) Activates the viewer control if appropriate. Sets computer switch to viewing position or types in appropriate codes to view scan.

e. Performer views the scan in a white-to-black range on a cathode ray tube or TV monitor showing the "slice(s)." Depending on equipment, performer uses controls on viewing unit or calls appropriate subroutines and types responses to teletype to adjust display to provide the best diagnostic information. Follows radiologist's orders, standard orders, orders on requisition sheet, or varies displays using own judgment, as appropriate.

   i) Checks that identification information showing on display is correct.
   ii) Performer may note the appropriate density levels for the material under examination and the information required, or checks the settings appropriate for display so that the picture to be viewed provides even steps of intensity change along a gray scale from black to white.
   iii) Sets the window (display) width as appropriate to the type of density range needed, i.e., such that all values above the range will be undifferentiated at one extreme, such as white, and all values below the range will be undifferentiated at the other extreme, such as black.
   iv) Sets the window level (mean) to correspond to the median density value desired for the median or center gray-tone within the range.
   v) Performer adjusts the window mean (level) and/or window width by using appropriate manual controls or subroutines until the picture displayed demonstrates the sharpest density gradations for the tissues in the area of interest and the possible pathological material involved, or follows radiologist's orders.
   vi) Depending on options available, performer may note or set controls to read the density value at any point in the picture at request of radiologist or for evaluating picture. May use controls to blacken all picture elements at a given display level, have them flicker, outline them. May use controls as appropriate to magnify an area or otherwise modify the display of the contiguous "slices."

f. Performer makes photographs of the gray-level cathode ray tube or TV monitor display(s) as ordered by radiologist, requisition, or according to standard procedures. May use control to position identification information to be photographed with display. When a display is obtained of which a permanent photographic record is desired, performer may proceed as follows:

   i) Checks that roll film, Polaroid, or other camera is loaded if not already done.

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ii) Sets any appropriate control to "photograph" setting.

iii) May set shutter and aperture as appropriate.

iv) If appropriate, swings camera into position and checks that appropriate light is on.

v) Operates camera exposure control to take picture of display.

vi) If Polaroid or other automatic processing camera is used, waits for exposure to be completed, pulls out tabs as appropriate, and waits for film processing to take place. Peels off or separates developed print from negative without letting print come in contact with negative. Discards tabs and negative as appropriate, avoiding any contact with caustic jelly. May fold and wrap negative to discard.

vii) Continues with additional photographs as described.

viii) If roll film is used, when all photographs have been taken of the scan (or for a single patient), may remove as appropriate and place for processing, or decides to do personally.

ix) When each processed photograph is ready, checks that photo has the same appearance as the display being viewed. If not, reports to proper staff member.

x) If the film used requires a coat of fixer, may accumulate the developed photographs and have them coated with fixer, or decides to do personally.

xi) If, during the course of procedure, camera needs reloading, performer reloads Polaroid pack or roll film as described.

xii) If identification information photographed with display is not sufficient, performer may use marking pen to write in additional information such as window width and level (mean) or other option selected.

g. If equipment has a capacity to display scans in color, performer may call a preselected color scheme or spectrum (with each color corresponding to a display level) by using subroutine and teletype; may create new color representations as appropriate by defining intensity factors for the base colors of the TV color monitor.

i) Depending on equipment, performer uses options to vary color display as described, such as flicker, magnification, making all picture points of a given display level turn a particular color.

ii) If a color camera is available, performer may make color photographs of display following steps similar to those for black-gray-white photographs.

h. If a line print-out of the relative density values of the picture points is required or ordered, and if not already done, performer may type appropriate code for printing and set controls. If appropriate, performer may use controls to specify which of the pair of scans, and which of the rows and columns are to be printed. Performer tears off printed output as appropriate and sets aside for review by radiologist.

i. If not already done, and if there are standard orders(or if performer decides)to record the current scan on magnetic tape for permanent storage (numerical relative absorption coefficients from which pictures can be called for display at

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any future time), performer may proceed as follows:

i) If not already done, performer checks that magnetic tape unit is loaded and set to record. If necessary, loads as appropriate as described earlier. May fit a "write enable" ring to the tape reel.

ii) May refer to log book and enter or check tape directory (identification data) and code numbers. May set appropriate controls to enter tape label information.

iii) Enters appropriate code to transfer the scan data from the computer or disc to permanent record on magnetic tape.

iv) May defer transfer to tape until all the scans for a patient have been run, until the disc is full or until end of day.

v) May operate controls to obtain print-out giving record labels or tape directory information showing tape contents. May attach to tape reel; may write in other identifying information.

7. When the performer has made any permanent records ordered for first scan, continues with any other scans ordered to be done before review, or ordered by radiologist as a result of review:

a. Performer resets controls as appropriate to resume scanning.

b. Manually or mechanically adjusts equipment for the next scan level and angle as appropriate. Carries out any other changes required.

c. May check that the next scan number has been assigned, and/or pushes appropriate control and uses teletype to read in any additional information.

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d. Proceeds with additional scans, viewing and recording as appropriate, as described.

8. If so ordered, performer brings C.T.T. scan photographs, computer print-outs, prior films, and patient's chart to radiologist for review, and/or tells radiologist when the series of scans are available for visual display.

a. If not already done, performer tells radiologist about any difficulties encountered during scanning, viewing and making of permanent records.

b. During radiologist's review of scan data, performer may discuss scan control decisions, may call scan data for visual display, may vary display options, may make additional photographs, print-outs as requested by radiologist. Repeats appropriate steps.

c. If radiologist indicates that the scans are not technically adequate, or that more information is needed, notes radiologist's orders for additional scans with a change in level or thickness of "slice," angle of scan, technical factors, collimated beam width, use of patient motion control (control setting and/or use of immobilization or sedation).

i) Notes whether further scans will be delayed so that residual contrast from prior examination can be removed, or patient can be sedated. Records or notes for later use.

ii) Notes whether need to repeat scans is due to performer's own negligence or lack of at-

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tention so that performer can avoid future "retakes." If request for retake reflects malfunctioning equipment, reports malfunction to appropriate staff member or decides to check.

d. If the radiologist decides to repeat scanning at one or more levels with intravenous infusion or injection of an iodine based contrast medium to enhance tissue density and improve differential contrast, notes radiologist's orders on how to proceed:

- i) Notes whether a test dose will be administered.
- ii) Notes whether contrast will be administered by intravenous injection or infusion.
- iii) Notes radiologist's orders for postinjection time sequence, orders for scan level, angle, and other relevant factors.
- iv) May note orders on amount of contrast or change of equipment or supplies and injection site.

e. Performer repeats any non-contrast C.T.T. scans as ordered, making any adjustments as appropriate. Repeats appropriate steps and awaits further orders from radiologist. Continues as ordered. Refrains from commenting to patient on the scans or providing any interpretation.

9. If contrast will be administered, performer may assist with any or all of the following:

a. Performer sets controls for post-injection scans as described, adjusting for radiologist's orders. May type in identification information to indicate use of contrast material.

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b. May have syringes or IV bottle prepared with contrast medium (iodine based solution) or decides to do personally. Performer may check that temperature is appropriate, there is no chemical deterioration, and type of contrast is appropriate.

c. If intravenous infusion method is to be used, performer may set up IV infusion apparatus. Attaches bottle of prepared contrast solution to sterile IV tubing. Hangs at appropriate height on pole near patient with clamp in closed position. Makes sure IV equipment is clear of any moving portion of scan apparatus.

d. Arranges to provide or change any equipment or supplies as ordered by radiologist. May supply emesis basin and clean towels.

e. Performer may position patient on scan table or couch as appropriate for introduction of contrast. May have injection site prepared or decides to do personally.

f. Informs radiologist when patient and materials are ready for introduction of contrast solution.

g. If performer is to assist with test injection and/or administration of contrast medium, washes hands, observing sterile technique as appropriate.

- i) May assist radiologist as appropriate by handing materials and supplies asked for following sterile technique.
- ii) May provide support for patient's arm used for injection. Performer assists radiologist in caring for patient if there is nausea or vomiting. Reassures patient. Cleanses patient. May provide damp cold

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towel to alleviate flushing symptoms. Cleans off any spills on scanning unit and controls.

iii) With infusion technique, performer may periodically check that needle has not become dislodged and that the fluid is dripping at an even rate. If there are any problems, performer clamps tube and notifies an MD or RN at once.

iv) As appropriate, keeps track of time elapsed. If appropriate, makes sure that patient is in the care of a staff person who will observe patient's reactions or decides to do personally. Remains alert for any symptom of severe pain or adverse reaction to the contrast. As soon as performer judges that reaction may be severe, ceases procedure and notifies radiologist or attending physician at once.

h. Unless there is severe reaction, performer makes postinjection C.T.T. scans at appropriate time as ordered, as described above. Makes permanent records such as photographs, print-outs, magnetic tape record as described. Informs radiologist and presents for review and/or assists with visual displays as described.

i. Performer notes radiologist's instructions after scan(s) is(are) reviewed. As appropriate, makes changes and repeats as ordered.

j. When appropriate and if not already done, assists with removal of IV apparatus or has this done.

10. During scanning and viewing procedures performer observes the patient, scanning unit and x-ray output meters to make sure that patient is all right

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and that equipment is functioning properly.

a. Throughout procedure performer observes patient for any signs of emergency, adverse reaction to contrast, and/or to prevent or respond to an accident. Is alert to signs suggesting faintness or any impairment in respiration.

b. Notifies nurse or physician at once if patient shows emergency signs.

c. Makes sure that any life support devices are being monitored and that patient is not left unattended. Is especially careful to prevent patient from falling.

d. If, during positioning, patient shows signs of severe pain, performer may notify appropriate, nurse or physician at once and await orders.

e. If there are any signs of patient emergency, malfunction or overheating of equipment, or indications of oil or water leakage, performer uses emergency shut off controls. Removes patient from scanner. Makes patient as comfortable as possible and reassures. Notifies appropriate staff member or decides to call service organization.

11. When performer is told by radiologist that the examination has been completed, or when performer is sure that the examination has been completed (with scans to be reviewed at a later time), performer carries out termination steps for the examination. May carry out any or all of the following as appropriate:

a. Informs patient and any staff member that procedure is terminated. Coordinates with anesthesiologist

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(if present) and/or any other staff members responsible for recovery and aftercare of patient.

b. Performer removes IV equipment if not already done, or has this done. Removes any restraining devices. Moves scanning equipment out of the way of patient or uses controls to move patient on table to a clear position so that patient can rise or be assisted to leave.

c. May decide to assist patient from table. Makes sure patient is reminded of any footrest in stepping off table.

d. May have infant patient fed, transported back to room, to parent or guardian, or to next location, or decides to do personally, as appropriate.

e. May make sure that patient is attended and will be transported to appropriate next location such as recovery area or room; may decide to do personally; if out-patient, may arrange to discharge or send patient home (with escort if appropriate).

f. Performer may have room and equipment cleaned; has any other appropriate clean up procedures followed or decides to do personally, depending on institutional arrangements.

g. If appropriate, may present requisition form to radiologist for comments and signature, and/or has requisition sheet for rescheduled or additional study signed.

h. If not already done, may transfer scan data to magnetic tape. If necessary, may have fixative applied to scan photographs or decides to do personally.

i. Performer records the examination in log book and/or in patient's chart or requisition according to institutional procedures. May include date, room, time, number of scans run including retakes, the levels, angulation and other options selected, whether contrast was used. Enters the disc and/or tape code number, scan code numbers (file or record numbers) for later retrieval. May record the photographs and print-outs made. May write in notation on problems such as patient movement. May enter the estimated radiation dose to which patient was exposed (using posted information on dosage). May record any problem with equipment, any special care provided patient. If any scans called for in the initial request could not be obtained, performer may record reasons. Signs requisition sheet.

j. Performer may decide to jacket scan photographs, line print-outs, requisition sheets, and related materials personally or have this done, depending on institutional procedures.

k. May indicate to appropriate staff person when the performer is ready to proceed with next examination.